# PENSIONS

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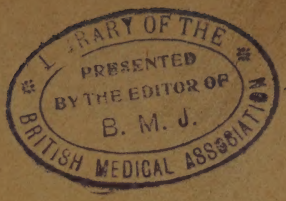
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# PENSIONS

## AND THE PRINCIPLES OF THEIR EVALUATION

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BY

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CO-AUTHOR OF "MALINGERING, OR THE SIMULATION OF DISEASE"

WITH A SECTION ON

## PENSIONS IN RELATION TO THE EYE

BY

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ACTING OPHTHALMIC SURGEON TO THE BATH WAR HOSPITAL;
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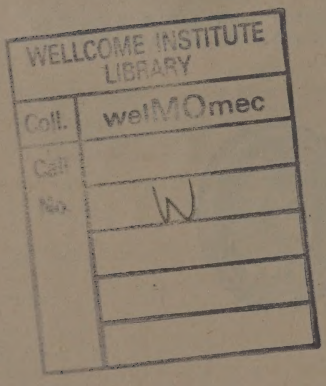


*London : William Heinemann (Medical Books) Ltd.*, 1919

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# PREFACE

As the fog of War recedes, the insensate havoc wrought stands forth in bleak relentless clarity—" the abomination of desolation." Its aftermath of human suffering, that " vast dumb heap " of anguish inarticulate, how sense, much less compute, the sum thereof ? How, too, approach the lesser task—wherewith mete out the measure of the individual sacrifice ? For " in the fell clutch of circumstance " to this are we as a profession committed, and this, too, without hope of evasion. Onerous alike our responsibilities to State and soldier—to defend the one from imposition, to secure to the other his lawful rights. What, too, of our debt to the fatherless and the widow, most poignant of war's victims ?—bequeathed to us in solemn trust, price of that " greater love " unpaid and unpayable.

It is, we repeat, with the more limited sphere—the Individual sacrifice—the measure thereof—that we are concerned, and to which our purview is delimited. Even so—a task of consummate difficulty—one such that the mere essayal thereof savours almost of temerity, if not arrogance. To appraise and forsooth assess the malign effects of disease or injury, of bodies maimed and marred, of minds distraught, of hopes forgone, of lives forsworn !

To be candid, our enterprise is even more pretentious—involves none less than interpretation of these same in arithmetical terms—in percentage grades of incapacity. Grades of incapacity, aye, but what of grades of sensibility—individual aptitudes of suffering—how evaluate these things oft " more sensible than visible " ?

Let us be frank—recognize clear-eyed our limitations—our inability to appraise even approximately the full consequences of disease or injury. The problem is in truth as yet too recondite, the field of inquiry a *terra incognita*, bristling with obstacles to o'ercome, pitfalls to avoid and withal gravid with potentialities for good or ill !

Herein lies the *raison d'être* of this work, which took origin in the feeling of bewilderment that o'erwhelmed us, and as we apprehend others also, when first charged with the duty of evaluating incapacities, of allocating arithmetical equivalents

thereto. For in this country, as far as we are aware, no systematized attempt has hitherto ever been made to formulate the principles that should govern our evaluation of disabilities or infirmities. These, it cannot be gainsaid, stand in urgent need of definition—this if only to avoid too glaring disparities in the assessment of identical lesions. It is the more imperative that we crystallize our ideas on this question, in that—in contradistinction to our procedure under the Workmen's Compensation Act—we cannot in grading *pensions* take as our criterion the *earning capacity*. In other words the evaluation of a disability or an infirmity in an injured workman seeking redress proceeds on an *economic* basis, while in contrast the claim of the disabled soldier is adjudged by a *physiological* standard. In short, the former is appraised as an industrial, the latter as a physiological machine. This, then, the canon of differentiation, albeit both processes of evaluation are alike unfortunately open to cavil.

Thus, all injuries do not necessarily involve a reduction in working or earning capacity, though nevertheless they predicate a breach of anatomical or physiological integrity. Judged by an economic standard, the injured workman, whose earning capacity notwithstanding remains unimpaired, may prove ineligible for compensation—this despite a persistent blemish, an enduring functional defect. It is, for example, unusual to allow compensation on purely æsthetic considerations, or for minor functional disabilities not prejudicing the victim's earning powers.

Conversely, the disabled soldier, evaluated on a purely *physiological* as opposed to a professional basis, may likewise suffer relative injustice. His anatomical or physiological defect will, it is true, entitle him to a gratuity—a pension temporary or permanent. But although the same may or may not be of grave economic import to the subject, we cannot take cognizance of its reaction on his earning capacity. He will, if he lose an eye, a limb, or part of a limb, be automatically awarded a pension identical with that allotted other soldiers similarly afflicted. This indifferently, though obviously the loss of an eye or a member is not the same for all men—certainly not in an *economic* or *professional* sense. It is clear then, on reflection, that the ideal method of evaluation would be one based on a *physiologico-professional* basis. In other words, a mode of appraisement which, while recognizing the claim to pension even for injuries not compromising the victim's earning powers, would at the same time, in those instances in which the same is prejudiced, take cognizance of its particular economic significance to the individual.

Unfortunately, the appalling number of disabled sailors and soldiers, the diversity of vocations, the wide disparity in earning

capacity, would seem to preclude any evaluation save by a physiological criterion. Nevertheless, this method of appraisement has advantages—it secures *uniformity*, though it fails of *discrimination*, that essential feature of sound administration. Alive to this defect we must, deprived of the criterion afforded by fluctuations in earning capacity, take a catholic view of our responsibilities.

In keeping therewith we must envisage the disabled soldier not merely as a physiological or anatomical unit, but as a Man—a sentient being capable of infinite though varying capacities of suffering. If our estimate is to be a *physiological* one, let it be adequate, and withal redolent of Sympathy. In this, public opinion has assuredly struck the right chord in insisting that in all our dealings with War's victims we give full range to the more generous sentiments of human nature. No cash nexus will suffice, save it be mellowed by all that kindly love and solicitude may suggest.

Looking to us to give effect to its wishes, the nation will demand that our professional attitude display the right blend, be not coldly scientific, but human and understanding. To this end we must visualize to the utmost of our ability the significance to the victim of, e.g. *mutilations*—be acutely alive to the congruity, the reciprocal dependence of the various parts of the body as "members one of another." Something, indeed, must we imbibe of the sense of the mysterious that inspired the muse of George Herbert, the seventeenth-century psalmist:

> Man is all symmetry,
> Full of proportions, one limb to another,
> And to all the world besides,
> Each part may call the farthest brother:
> For head with foot hath private amity,
> And both with moons and tides.

For the rest, it were well that we approach our task—the evaluation of pensions—not only with a lively sense of our obligations to those who have suffered on our behalf, but conscious also of our professional limitations—our necessarily imperfect grasp of the measure of the sacrifice exacted, the suffering endured. Instinct with sympathy and insight, our appraisements will more surely escape being of soulless mechanical nature—that besetting sin of unintelligent routine awards:

> For what you see is but the smallest part
> And least proportion of humanity.—*Henry VI*

So much for the avowed object of this work, and now to outline the scope and content thereof. It may be regarded as

divisible into five sections, the first of which deals with pensions from their historical aspect. In our brief résumé, two salient facts emerge, the antiquity of pensions, and alas, though less creditable, the tardiness with which the State has awakened to the magnitude of its indebtedness to those who have suffered for King and Country.

In the second section we endeavour to trace the growth of the existing pension scheme—the evolution of order out of chaos. For if unready for War, we were still more unready for War's aftermath. In continuance we pass in the third chapter to indicate the provisions for Treatment and Training, and the multiplicity of innovations but brings into bolder relief the almost criminal inadequacy of all previous pension systems. Here, too, we have interpolated a few paragraphs relating to the magnitude of our financial commitments in this sphere—the chapter closing with a discussion of the ideal aims of the newly fledged Ministry. These not only envisage the physical but the moral and economic well-being of the disabled hero, in short, his Renaissance, his reabsorption into the community as a self-supporting, self-reliant unit. In truth a lofty and noble conception, of such catholicity that its achievement is of the nature of a national crusade, its quest, its Holy Grail, none less than the redemption of the halt, the maimed, the blind!

Chapter iv is concerned with some aspects of pension legislation, more especially possible sources of corruption and their avoidance. Care, for example, must be taken to dissipate betimes the erroneous belief that pensions are a reward for "patriotic services," as also to nip in the bud any tendency to confound Military with Old Age Pensions. For the besetting danger of all pension systems is the extension of their privileges beyond the point contemplated by the Royal Warrants, with consequent deflection of public moneys into unauthorized channels. None will deny, too, the call for discrimination, the maintenance of discipline, and last but not least, immunity from that *bête noir* of all pension schemes—the intrusion of party politics. Here we cannot withhold our meed of admiration to the Minister of Pensions for the courageous and uncompromising manner in which he has withstood insidious and wholly pernicious overtures in this direction. Assuredly no factor would be more calculated to lower public *morale*, to undermine the stability of our pension system, than that it should become the battle-ground of opposing factions—its awards a species of political largesse.

Chapter v is occupied with the evolution of the Royal Warrants, more particularly the Articles relating to Temporary and Permanent Pensions, as laid down in those of 1917 and 1918

respectively. Analysed in serial fashion, it becomes clear that the tenor of the successive Warrants reveals an increasing perception of the need for discipline. The investment of the Minister with power to order a review of any pension, whether temporary or permanent, is, we think, much to be commended. Albeit, we venture to suggest the intent of the Royal Warrant—viz. that pensions should be graded in " proportion to the degree of disablement "—would be more surely achieved if all pensions, even when *permanent*, were liable to periodic review—biennially, triennially, or at longer intervals.

In chapter vi the disciplinary clauses at present in force are critically analysed, more especially those relating to refusal of treatment or training. We take exception to the fact that while refusal of certain forms of medical treatment may involve reduction of the pension and allowances (if any) by one-half, the same penalty is not enforced in the case of disabled men refusing surgical measures, whether such refusal be reasonable or unreasonable. It having been conceded by the Ministry that refusal of treatment justifies reduction of pension, it is, we think, inequitable that this penal clause be applied in selective and not uniform fashion. In other words, we consider that if a sailor or soldier refuse medical or surgical treatment, as prescribed by responsible advisers, the pension authorities shall not shirk the issue, but shall decide whether such refusal be reasonable or unreasonable—and in the latter event invoke the penalty in impartial fashion.

Again, while admitting that persuasion, not compulsion, is the true key to happy solution of the painful problem presented by refusal of disabled men to undergo training, we nevertheless submit that the Ministry should, to enable it to deal with aggravated examples, arrogate to itself the power to reduce the pension and allowances of such misguided individuals. The attitude of the " passive spectator " is, we think, unworthy of the dignity of the Ministry, as, let it not be forgotten, in the eyes of the impartial historian the success or not of our pension system will be measured by its effect, adverse or other, on the *morale* of the nation.

In regard to the much-discussed article relating to pensions when disablement takes effect after discharge, we have pointed out the danger that attaches to the absence of a " time limit," and the wellnigh insuperable difficulties confronting medical assessors. As safeguards against abuse and to promote the better elucidation of *post bellum* claims we have suggested the desirability of special examination forms with interrogatories best calculated to elucidate the validity or not of such belated claims.

The third section deals with the mode of procedure to be adopted in the examination of claimants for pension. Chapter vii therefore, is devoted to determination of the all-important point —the reality or not of the disability or infirmity. This at once brings home to us the immense responsibility thrown upon the medical profession. To emphasize the measure thereof we would recall the corruption, too often forgotten, in connexion with the Peninsular War, and which drew from the *Lancet* of those days the caustic observation that "Pensions had been dispensed ignorantly, unjustly, and extravagantly." Our Pension Roll should be a "Roll of Honour," and upon us devolves the onus of guarding the State from imposition. We have, therefore, in this same chapter envisaged briefly the principles that should guide us in the detection of malingering in all its various forms.

The reality of the disability being conceded, it is necessary that "the conditions of claim" be established. This essential point, the verification of the origin of the disability or infirmity, is, as far as possible, exhaustively dealt with in chapter viii—the interrogatories of Army Form B.179A constituting the basis of the lines of inquiry. Subsequently the evolution and gravity of the disability or infirmity call for investigation, as upon the results thereof will be determined the eligibility of the subject for a gratuity, or a temporary or permanent pension. Passing in review the conditions qualifying for temporary or permanent pension, we also emphasize the danger of reckless assumptions as to incurability with its correlated and unauthorized relegation of such examples to the *permanent* category. The cure or amelioration of a disability too, being frequently contingent upon an operation, we have deemed it convenient to discuss here in detail the reasonableness or unreasonableness of a refusal to undergo the same.

Chapter x is of the nature of an interpolation, dealing, as it does, with a biological factor, as yet largely unrecognized, *functional adaptation*. This beneficent power of adaptation to the consequences of mutilations and other bodily defects is in truth nature's method of compensation. Its profound economic significance has not been overlooked by the German Imperial Insurance Office, which, in practical appreciation thereof, holds itself justified in reducing annuities according to the measure to which functional adaptation has been achieved.

The influence of rhythmic forms of activity in reinforcing the adaptive capacity of crippled individuals is adequately dealt with, as also the effect of legislation in facilitating or retarding the acquirement of adaptation. Lastly, arguments are adduced

in favour of this factor—functional adaptation—being taken into consideration in the evaluation of permanent pensions.

Chapter xi is occupied with a discussion of the principles of evaluation. The different bases adopted under the compensation laws as opposed to those obtaining under the pension system are contrasted—viz. professional and physiological evaluation. Subsequently, stress is laid on the fact that the true basis of evaluation resides in "function," not in the "objective" or "anatomical" condition. Thence follows an analysis of the Schedule of Specific Injuries from this standpoint, whence it becomes clear that in some instances "anatomical loss," in others "functional loss," is adopted as the criterion. This commingling of the two bases of evaluation is, we think, much to be deprecated. The urgent need of authoritative pronouncements defining the basis and principles of evaluation is obvious, as also of revision and enlargement of the schedule along the lines of the French "Guide Barème des Invalidités." The difficulties presented by multiple disabilities and the various methods of evaluating the same are dealt with in detail; while sections dealing with the assessment of absolute and minimal incapacities and also of æsthetic deformities are here interposed, the section closing with our principal findings in this important sphere.

We now proceed to section iv, which marks our entry upon the more technical portions of this work. In other words, from henceforward we deal with the practical application of the principles laid down in previous sections. In chapter xii are discussed the general factors of evaluation in regard to ankyloses, whether total or partial. Such as, for example, the identity of the articulation, the angle of fixation, the arc of movement retained, and so forth; while chapters xiii and xiv are devoted to the evaluation and assessment of the various joint lesions as they occur in the upper or lower extremities respectively.

In these as in subsequent chapters the figures of assessment advanced by ourselves are such as we deem appropriate in the fixation of pensions, as are likewise those adduced from the French "Guide Barème." For the sake of comparison we have, however, frequently inserted in the text the assessments of noted experts, as laid down by them in regard to injured workmen seeking compensation for "industrial accidents." In addition, in certain chapters tables are appended giving the average assessments for particular lesions as laid down by French, German, Austrian, and other Continental tribunals.

Chapter xv is devoted to a discussion of the general principles of evaluation in fractures—stress being laid upon functional efficiency rather than anatomical union as the true criterion

wherewith to gauge the measure of residual incapacity. In accordance therewith the central lesion, its mode of repair and so on, as likewise the collateral phenomena or complications when present, are all viewed and adjudged in light of their aggregate effect on the functional aptitudes of the implicated limb. In chapters xvi and xvii the evaluation and assessment of fractures as met with in the upper and lower limbs respectively are considered in detail. In these as in the corresponding chapters on ankyloses, we have interpolated the periods required for adaptation to the consequences of such lesions as laid down by the German Imperial Assurance Office. Chapter xviii is devoted to a consideration of the evaluation of cicatrices. The significance of tenderness, retractility, fragility, and so forth in scars is discussed, as likewise their often adverse influence on the mobility of neighbouring joints.

Chapter xix is occupied with a discussion of the method of procedure to be adopted in the evaluation of radicular and peripheral nerve lesions. Their frequency of incidence in the present war, and no less the extreme complexity of the problems presented, do, to our mind, fully justify the detailed consideration accorded them. Indeed, the onerous responsibilities thrust upon the medical assessor in this sphere are such as predicate for their adequate discharge a very profound knowledge of nerve injuries.

In chapters xx and xxi the evaluation and assessment of nerve lesions in the upper and lower extremities are dealt with in detail. The salient clinical phenomena of each individual nerve injury are first briefly noted, and then, to avoid fallacious assumptions, the genuine as opposed to the spurious signs of impending recovery are dealt with as a prelude to the evaluation and assessment of such lesions.

In chapter xxii the evaluation of muscular lesions is considered, while injuries to bones and other structures are dealt with in chapter xxxiii. The section closes with a chapter dealing with the appraisement and assessment of amputations and disarticulations in the upper and lower extremities.

In the fifth section we pass on to consider the evaluation of disabilities or injuries located in the sense organs. Those pertaining to the eye have been undertaken by Mr. W. M. Beaumont, of Bath, who devotes four chapters to their elucidation—the work closing with a chapter dealing with the evaluation of aural lesions.

Having outlined in brief the contents of this treatise, we would point out that exigencies of space preclude the possibility of including therein any attempt at evaluation of the disabilities or infirmities relating to injuries or diseases of the internal organs—

the consideration of which must necessarily be postponed to a subsequent volume.

Nevertheless, we trust that it may prove helpful to medical referees and others interested in the subject of pensions, assurance, and compensation. Also we hope that it may be found of some use to the members of the legal profession, likewise to political and social reformers.

The pleasing duty now devolves upon us of acknowledging the aid afforded us by other workers in this same field, and we would single out in particular our indebtedness to Continental authorities—notably Imbert, Oddo, Chavernac, Forgue and Jeanbrau, Liniger, and Julliard: not to mention the help derived from study of the French "Guide Barème des Invalidités," the illumining treatise on Deafness by Bourgeois and Sourdille, and Mme. Benisty's lucid brochure on Nerve Injuries.

Of English writings in this same sphere we would gratefully acknowledge the assistance forthcoming from the "Index of Prognosis," various standard works on surgery, and in the matter of pension legislation, our indebtedness to American writers, notably Burton J. Hendrick and Charles Francis Adams. To Sir John Collie, too, our cordial thanks are due for permission to reproduce the chart on p. 42, which originally appeared in the periodical called *Recalled to Life*, and from which we have culled much information regarding the endless ramifications of our pension system. We hasten, too, to place on record our extreme gratitude to Professor Watson, D.Sc., of the University of Birmingham, for most valuable suggestions—notably for the formulæ relating to that intricate subject, the evaluation of multiple disabilities. Also we esteem highly and gladly recognize our debt to Captain Peter Edwards, R.A.M.C., not only for the meticulous care with which he revised the proofs, but for many helpful criticisms in regard to the subject-matter. Here, too, we would include the names of Captain R. G. Gordon, R.A.M.C., Bath; Mr. Wade, F.R.C.S., of Cardiff, and Dr. Bizarro, late of the Welsh Metropolitan War Hospital, Whitchurch.

The important task of indexing this work was entrusted to the capable hands of Mr. Charles Hewitt, to whom we would proffer our most cordial thanks, as also to Miss Donnan and Miss Crosse, who undertook the arduous task of typing the manuscript thereof.

Of the courtesy of our publisher, Mr. Heinemann, we are deeply sensible—this the more in view of the extraordinary difficulties that at the present juncture hamper the process of publication.

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# CHAPTER I

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Patriots have toiled, and in their country's cause
Bled nobly, and their deeds, as they deserve,
Receive proud recompense.

COWPER

To the student of human nature inquiry into the origin of Pensions brings the comforting reflection that their installation dates from the most remote times—so remote, in truth, that they may be almost said to mark the first glimmerings of a sense of Equity on the part of Monarchs or States toward those who upheld their standards or maintained their integrity against hostile incursions.

Thus in the first Book of Esdras we are told of Darius, King of the Persians, who reigned from 521–485 B.C., that "He commanded to give to all that kept the city pensions."

Passing to the times of Ancient Greece and Rome, we find that to lay down one's life for king and country was to Greek or Roman no work of supererogation, but an elemental duty of citizenship, albeit in exacting such self-sacrifice on the part of the individual they realized fully that the monarch or State incurred in turn each their obligation. This in no uncertain terms was enunciated by Solon the Athenian, who laid down the law that "Persons maimed in the war should be maintained at the public charge."

Nor were the Romans less sensitive to the dictates of equity. Thus Modestinus, who lived about A.D. 230, in his "Digest" speaks of "Annua meritorum" in reference to Roman soldiers; while the phrase "Commoda emeritæ militiæ" clearly shows that long-service pensions were in force even in those far-off times.*

### Grants of Land to Soldiers

The Latin word *pensio* signifies a "payment," though not necessarily a *monetary* gratuity. Thus all those familiar with

* Augustus in A.D. 6 instituted a military treasury (*ærarium militare*) comprising all moneys raised for and appropriated to the maintenance of the army inclusive of a pension fund for disabled soldiers. Largely endowed by the Emperor himself, it derived support also from the proceeds of the tax on public sales and the succession duty. ("Monumentum Ancyranum," iii, 35.)

Macaulay's " Lays of Ancient Rome " will recall that the grateful Romans bestowed a grant of land on Horatius for his valiant holding of the bridge o'er the Tiber.

> They gave him of the corn land
> That was of public right
> As much as two strong oxen
> Could plough from morn till night;
> And they made a molten image
> And set it up on high,
> And there it stands unto this day
> To witness if I lie.

Indeed, in whatever direction the Roman Empire extended, the fringe marking the line of newly acquired territory was commonly, if not invariably, bestowed on those legionaries by whose prowess it had been acquired. By such bestowals of land, the self-interest of these pioneer soldiers being enlisted, a corresponding obstinacy characterized their defence of hearth and home. In this way the confines of the ever-increasing empire were rendered doubly secure against the counter-attacks of the despoiled barbarians.

### *Growth of Corruption*

But alas, side by side with these generous requitals for service rendered on behalf of the Roman empire we find the seamy side of human nature obtruding itself in the ugly form of abuse. Self-interest, the " ruling passion of mankind," then, as ever, impelled the unworthy, the unscrupulous, to obtain by imposture the privileges rightly conferred on those more worthy. Witness the prevalence of malingering and other fraudulent practices as evidenced, not only in the writings of Roman physicians, but also in the allusions—satirical enow—which occur freely scattered throughout the verse of the Latin poets, Lucilius, Horace, and Ovid, not to mention the Satires of Martial.

### *Abolition of Pensions by Caligula*

How insistent and widespread was the corruption even then in regard to pensions is shown by the fact that it excited the alarm of that monster Caligula, who found in it a further excuse for indulging the cruel instincts of a degenerate despot; for to restrain the cupidity of soldiers he resorted to the extreme measure of abolishing war pensions, meting out the same penalty alike to hero and coward—more bent on saving the Imperial exchequer than on rendering honour to whom honour was due.*

* " Ceterorum increpita cupiditate, commoda emeritæ militiæ ad sex millium summam rescidit."

Still, without condoning Caligula's reprehensible method of dealing with the abuse of pensions, the evidence that flagrant corruption existed is undeniable. But, lest in our haste we attribute such to an innate predisposition peculiar to soldiers, we hasten to add that not the most exalted—nay, not even those who wore the Imperial purple—were immune from similar propensities. The Emperor Tiberius, in truth, may be said to have out-Heroded Herod in this respect, for Suetonius, in his "Life of Tiberius," tells us how he defrauded his wife of certain payments because Augustus in his will had not taken precautions against the possibility of such ignoble peculations.*

These scattered gleanings from the stores of classical history sufficiently attest the antiquity of pensions and alike the corruption that followed in their wake, and without further ado let us turn to the record of our own Empire.

## Pensions in Anglo-Saxon Times

Despite the mists that enshroud the early history of *Anglo-Saxon Britain*, the chronicles compiled by the scribes of Alfred the Great clearly show that pensions or their equivalent, *grants of land*, were even then an established form of reward. They were, in truth, the natural outcome of those endless struggles for supremacy waged between the old English kingdoms—the war-like leaders of Wessex, Northumbria, and Mercia, each and all striving to obtain the proud title of *Rex totius Britanniæ*. In the shifting fortunes of war each of these petty sovereigns sought to consolidate his ephemeral dignity by garrisoning with settlers or by military posts the land that had been subdued. These "burh-ware" or garrison men are repeatedly referred to in the Anglo-Saxon Chronicles, and while the privilege of serving their king carried with it the obligation to take the field whenever called upon, nevertheless they were assured of their reward in that "every ceorl who throve so that he had fully five hides of land, and a helm, and a mail-shirt, and a sword ornamented with gold, was to be reckoned *gesithcund*."

## The Feudal System

With the advent of the *Norman and Angevin Monarchy* we arrive at the essentially *feudal* state in which all land was a gift from the king—"*held on conditions of homage and military service.*" For the Norman kings, like their Saxon predecessors, sensible

* "Sed et peculio concesso a patre prebitisque annuis fraudavit per speciem publici juris, quod nihil de his Augustus testamenti cavisset."

of the instability of their thrones, sought to assure the personal fidelity of their vassals by conferring on them the confiscated estates of the conquered race. In turn the victorious baron, to secure the fealty of his retainers, after like fashion granted rewards in money or in kind in proportion to the quality of the services rendered.

In other words, the awarding of pensions or rewards was largely left to the mercy of *individual* charity. While the arrogant baron ran little risk of being overlooked by a sovereign whose tenure of the Crown might be imperilled by his vassal's defection, it was otherwise with the "villein," the lowly man-at-arms. Current usage, indeed, had it that his feudal lord would see to it that if valiant in fight he got his reward, and if perchance his life was forfeit, that his widow and orphans would be his especial care. But, if the sport of ingratitude, what power of redress had the luckless wight? What power had he to invoke the machinery of the manorial court that might enforce his claims upon those for whom he had risked life and limb? Still, happy was he that even in those days the feudal and ecclesiastical systems were closely interwoven. The portal of the mediæval monastery stood ever open, and seldom, may we hope, was the charity of the abbot invoked in vain for those benefits which a ruthless baron ignored or refused to acknowledge. Well indeed that it was so when "every shire was full of castles and every castle filled with devils and evil men" and the lowly villeins murmured that surely "Christ and his saints slept" (Anglo-Saxon Chronicles).

Subsequently, with the gradual *decay of the feudal system* the personal link between the baron and his more lowly comrades-in-arms grew more and more attenuated, until ultimately the maimed or disabled soldier had no other refuge than the *monastery*, and to abbot and friar they turned alike for treatment of their wounds and for their sustenance.

In the reign of that remarkable figure of the House of Plantagenet, Edward I, was established (1285) the *National Militia*. But as far as we have been able to ascertain, no specific clause pertaining to pensions was incorporated therein, though, of course, the *tenure of land* carried with it the obligation of military service.

Still, from the pages of Shakespeare we may gather the interesting fact that even in the far-off days of Henry IV Falstaff in his own person furnishes us with a striking instance of the knavery and imposition practised in the matter of pensions. Witness the audacity with which he holds forth to his boon companions:

A pox of this gout, or a gout of this pox! For the one or the other plays the rogue with my great toe. 'Tis no matter if I do halt; I have the wars for my colour, and my pension shall seem the more reasonable. A good wit will make use of anything: *I will turn Diseases to Commodity.**

How frankly knavish his admission that he will make commodity of his gout—born of intemperance—his nimble wit seeing in it but a source of profit—an added proof of his prowess in war, a further attestation of his worthiness of a pension!

While doubtless categorical representations as to pensions found a place in the statutes of early English law, still the earliest explicit statement to this effect that we have been able to unearth dates only from the period of the Wars of the Roses.

Thus we read that in the fifteenth century Edward IV made a grant to John Sclatter of four marks for the loss of his hand at the Battle of Wakefield; and another to Rauf Veshynden of an annuity of ten pounds, by letters patent under the Great Seal, till rewarded with an office, "for the good and agreeable service which he did unto us," says the patent, "in carrying and holding our standard of the Black Bull at the batayl of Sherborne."

Passing now to the period subsequent to the *dissolution of the monasteries*, we see the miseries of the maimed soldier reach their zenith. Then, as now, many a British soldier lost health and limbs in Flanders and in France, and historians of that period record how those in command in the Netherlands complained bitterly that they were required to make provision for the sick and wounded, "whose charge has laid heavily on them." With no friendly monastery at hand the maimed or mutilated soldier subsisted as best he might on the charity of the passer-by, and the ancient chronicler has it that Good Queen Bess was "troubled whenever she takes the air by these miserable creatures."

### *Elizabethan Statute*

Accordingly, in the closing years of her reign Elizabeth by statute ordained that

justices of the peace had power to charge every parish towards a weekly relief of maimed soldiers and mariners, so that no parish paid weekly above tenpence,

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* 1601. Shakespeare, *Twelfth Night.* Fabian speaks: "I will not give my part of this sport for a pension of thousands to be paid from the Sophy."

"And then he took his leaue of her Grace and came forth into the open courte where all the pentioners stoode." (Fabyan, "Queen Marie," an. 1555.)

"Full plac'd and pension'd, see Horatio stands." (P. Whitehead, "State Dunces.")

"Of princes and prelatus heor pencion schulde aryse
And of the pore peple no peneworth to take." ("Piers Plowman" (A.), viii. 49.)

nor under twopence; nor any county, which consisted of above fifty parishes, to pay above sixpence, one parish with another: which sums, so taxed, were to be assessed in every parish by the parishioners, or, in default, by the churchwardens and constables, or, in their default, by the next justice or justices of the peace. The tax thus collected was to be paid over to the treasurer of the county. A maimed soldier or mariner who had been pressed was to repair to the treasurer of the county where he had been pressed; if he were not pressed, then to the treasurer of the county where he was born, or where he last dwelt for the space of three years, at his election; but, if he was not able to travel, then to the treasurer of the county where he landed. He was to be furnished with a certificate under the hand and seal of the chief commander, or of the captain under whom he had served, containing the particulars of his hurts and services. Upon a proper certificate the treasurer might allow a man the means of subsistence until the next quarter session, when the justices were empowered to grant him a pension, not exceeding L.10 to a soldier, to an officer under a lieutenant, L.15, to a lieutenant L.20.

Unfortunately, as a subsequent clause in the statute clearly shows, corrupt practices were not wholly wanting, thus: "A soldier or a mariner who was found begging or who counterfeited a certificate was to suffer punishment as a common rogue and to forfeit any pension he might have."

Still, if soldiers were prone to fraudulent practices, the justices of the peace were not without reproach; for, resenting the charge obligatory on *counties* to make provision for "maimed, hurt, or grievously sick soldiers," they sought whenever feasible to evade their responsibilities by seeking to foist the maintenance of such derelicts on to a neighbouring county.

Writing in 1617 Moryson in his "Itinerary" observes: "They who are maimed in the Warres have from then a pension for life or the value of the pension in ready mony"—in which statement we may *note the first instance of the so-called commuting of pensions.*

## Provision for Dependents

During the closing years of the reign of Charles I we may discern the growth of a more lively sense on the part of the State of its obligations to the *widows and orphans of slain soldiers.* To this end (1643) an Act was passed "empowering a tax to be levied upon all parishes in England for the purpose of raising a fund for the relief of maimed soldiers and the widows and fatherless children." "All persons claiming relief from this fund had to bring a certificate under the hand of an officer belonging to the regiment . . . wherein the said soldiers or slain persons did formerly serve, of the truth of their being maimed or slain in the said service."

It was during the period of the Civil War that this altruistic enactment was installed—the fund being raised by Parliament

assigning thereto the proceeds of sequestered estates. To this was added the sum of £100 weekly from the Excise, while the Savoy and Ely House were invoked as residences for maimed soldiers.*

Luttrell (Narcissus) in "A Brief Historical Relation of State Affairs" somewhat satirically observes: "It was a Parliament gave those vast summes of mony and therefore called the *pensioner Parliament.*"

Nor can we wholly wonder at Luttrell's irony, for the record of the seventeenth century in the matter of pensions was a sullied page in English history, and doubtless therein we may discern one of the contributory factors in the downfall of the corrupt Stuart dynasty. How shamelessly pensions were invoked as bribes may be gathered from a passage culled from Macaulay's "History of England": "He bribed and stimulated both parties in turn, pensioned at once the Ministers of the Crown and the chiefs of the Opposition." Nor did Pope fail to exercise his mordant wit, as witness the couplet—

> The hero William and the martyr Charles,
> One knighted Blackmore and one pension'd Quarles.

Following the Restoration, Charles II on his accession repealed the Pension Statute instituted by his predecessor on the throne. Having enjoyed the benefits accruing therefrom throughout Charles's reign and during the Commonwealth, it may be imagined how bitterly this rank ingratitude was resented by both Royalist and Roundhead. This, forsooth, from that selfsame monarch to whom we owe the institution of the perpetual or *hereditary pensions* so lavishly granted by him to his mistresses or their offspring! †

The abolition of the Pension Statute by Charles II, however, seems to have evoked the latent powers of self-help possessed by the disabled soldier. For two years after Cromwell's Puritan army was disbanded we read in "Pepys' Diary": "Of all the old army now you cannot see a man begging about the street; but what? You shall have this captain turned a shoemaker; the lieutenant a baker; this a brewer; that a haberdasher; this common soldier a porter; and every man in his apron and frock, etc., as if they never had done anything else."

* During the period of the Commonwealth it is worthy of note that 2s. a week was granted by Parliament to the destitute widows of soldiers slain in battle.

† Also it may be remarked that in the year of James the Second's accession, 1685, it was enacted that the widow of a soldier slain in fight might claim eleven months' pay for herself and one-third of that amount for each unmarried orphan, and if there was no wife a widowed mother, if indigent, might claim the same amount.

*Naval pensions* were first instituted by William III in 1693, and regularly established by an Order in Council by Queen Anne in 1700.

### *Special Trade Privileges for Disabled Soldiers and their Dependents*

Still, the reign of Charles II saw the introduction of a statute by which " all officers and soldiers who served under the command of the captain-general of the King's forces in 1660, and who had not since deserted or refused to take the oaths of supremacy and allegiance, might exercise any handicraft or trade in manner following : viz. *such as had been apprentices might exercise such trades as they were bound to, though they served not out their time, with like immunities as if they had,* and all other such trades as they were apt and able for in the towns and places within the several counties where they were born ; and, if implicated or indicted for the same, they might plead the general issue, and should have double costs, if a verdict passed against the prosecutor, or if he was non-suited or the suit discontinued."

This privilege of exemption from penalties for exercising trades in corporate towns continued in force as regards discharged soldiers, their wives and children, up to the time of George III—a shadowing of the provision now made for the *re-education and readaptation to work of disabled soldiers.*

### Foundation of Hospitals for Pensioners

Nor was this all, for some years afterwards Charles issued a Royal charter for a hospital at Kilmainham for aged and maimed officers and soldiers on the Irish establishment. A grant of land was made in Phœnix Park, and, for the rest, the funds for these were derived from voluntary subscriptions and a compulsory deduction of sixpence in the pound from the pay of the Army in Ireland. This hospital was opened in 1684, and marks the *first systematic attempt to provide for disabled soldiers* in the British Isles.

The first stone of the Royal Chelsea Hospital, it is true, was laid in 1682 by the Sovereign in the presence of a great concourse of nobility and gentry, but it was not opened until 1690. Now Louis XIV founded the Hôtel Royal des Invalides in Paris in 1670, and we would recall the fact that by the secret Treaty of Dover entered into that same year Charles had not scrupled to stoop to become a pensioner of the French King. In short, for a sum of £200,000 a year Charles had undertaken to place the forces of England at Louis' disposal for the

purpose of aggression on the Continent. It is therefore probable that in light of this ignoble contract Charles realized in a very special sense the necessity of making military service as attractive as possible to the end of maintaining a steady supply of recruits. The construction of the edifice was spread over the successive reigns of Charles II, James II, and William and Mary, being finally completed in 1690.

To the erection of Chelsea Hospital large subscriptions were received from wealthy individuals, supplemented by a warrant (1684) under which 5 per cent., or one-twentieth shilling (poundage), was deducted from the pay of every officer and soldier in the Army, and, under the head of "hospital money," one day's gross pay annually. The meanness of the policy of forcing soldiers to maintain the hospital's endowment by deductions from their own pay makes ill reading; but the fact remains that throughout the eighteenth century the State only supplemented these compulsory contributions when the pension fund from time to time proved inadequate. In 1771 George III "was pleased to direct that the private men of the infantry should be exempted from poundage in these dear times."

The Chelsea Hospital, while at first capable of accommodating all the disabled soldiers considered fit recipients of the bounty of Government, yet proved inadequate as far back as 1760, when even at that date a portion of the British forces consisted of "invalids." Marshall, in his treatise on "The Pensioning of Soldiers," observes that "the men of these corps or companies were soldiers partially disabled by wounds or veterans who from old age and length of service were rendered incapable of the duties of an active campaign, but who were still judged fit for garrison duty."

In the year 1731, during the debate which took place in the Commons on the motion "That a sum not exceeding £25,348 2s. should be granted to His Majesty on account of out-pensioners of Chelsea Hospital for the year 1732," it was elicited that the "invalid companies" amounted to no less than four thousand. One of the Members in his speech observed that the pensioners were admitted as old and infirm, "but, being in, they seem immortal, their numbers never decrease. Surely many of these immortal old men might have served as good soldiers even in a marching regiment, especially in peace, when there's no occasion for any great fatigue."

A recent writer, Captain Basil Williams, has recalled that "the only soldiers allowed to Anson when he set forth on his great voyage were five hundred pensioners—men 'who from their age or wounds or other infirmities are incapable of service in

marching regiments.' " Anson was naturally chagrined at having such a decrepit detachment allotted to him, all the more when even of these all who were able to deserted, leaving him only those who were literally invalids of sixty to seventy years old.

*Financial Disabilities of Pensioners*

From a financial aspect the position of the pensioners was anything but happy, for previously to 1754 they did not receive their pensions until a year's allowance had become due. Apart from this payment by " annual instalments in arrear," their paltry pittance was further depleted by the rapacity of Pay Office clerks, who exacted commissions on all pensions. In this way—as far as their first year was concerned—the only method by which the unlucky soldier could subsist was by borrowing from moneylenders on the security of his pension. Fortunately, in 1754 William Pitt, having it " much at heart to redeem these helpless, unthinking creatures from their harpies," passed a Bill authorizing the pensions of discharged soldiers *to be paid in advance at a half-yearly period*; to this was added a clause enacting that *all contracts should be void by which a pension might be mortgaged*, and that the extortion of the pension officers should be rendered illegal. (This half-yearly payment of out-pensioners continued until 1815, when by Act of Parliament the Commissioners were directed to pay the pensioners quarterly—poundage, however, being deducted from the amount of pensions in consequence of the issue being made in advance.)

During the *Peninsular Wars* the subject of pensions became again one of paramount importance, and in the Session of 1806 a new warrant was issued containing the code of " Orders and regulations for the better ordering of our Army, and for improving the condition of non-commissioned officers and soldiers, and for fixing the pensions, allowances, and relief to which non-commissioned officers and soldiers are to become entitled on their discharge, by reason of the expiration of certain periods of service, or as invalid, disabled, or wounded."

## Windham's Act

One of the most interesting features of the above Act introduced by Mr. Windham was that the *power of the Crown to grant or take away pensions was abrogated.* Moreover, " it gave to the soldier a *claim of right to a pension* upon the condition of serving for certain periods of time or if he were discharged as

*disabled* and *unfit* for service without reference to length of service." * But one cannot help wondering that an Act so excellent in principle failed to rescind the *obligation upon the soldier to contribute out of his pay to his pension.*†

### *Loopholes for Abuses therein*

Also from another aspect the Act paved the way for abuses in that in the framing of its regulations no cognizance was taken of the fact that a *soldier might become disqualified for the service through "disgraceful conduct."* As it stood, by the Regulations of 1806 the soldier's legal right to a pension for life could not be impugned "provided that he was not specifically deprived of that right by the sentence of a court martial, or that the disability for which he was discharged was not occasioned by vice or misconduct." Now the "vice or misconduct" contemplated in the Act was defined to be conduct which occasions a *physical* disability, viz. automutilation. It would appear from Marshall's work on "The Pensioning of Soldiers" that in their dilemma the Commissioners sought counsel's opinion as to what was included under the "vice or misconduct" formula. The pronouncement was that by the terms of the Act "*moral depravity*" *does not cancel a soldier's claim to a pension for length of service.* Hence, as Marshall rightly observes, "When a man has served the prescribed period which entitles him to a pension *he may procure his discharge by feigning disabilities or by the commission of crimes which may render it expedient to discharge him from a corps.*"

The interpretation obviously hampered the Commissioners in that it precluded them exercising any discretionary powers in regard to *character and conduct* when they awarded a pension. This being so, for practical purposes the chief function of the Commissioners when confronted with the soldier who had been "discharged as disabled or unfit for service" was to apportion a

* Rates of pensions of non-commissioned officers and soldiers discharged as *disabled* or *unfit* for service:

| | *Per diem* s. | d. |
|---|---|---|
| If unfit for service, but able to earn a livelihood . | 0 | 6 |
| If disabled, but able materially to assist themselves | 0 | 9 |
| If disabled, but able to contribute something towards their livelihood . . . . . | 1 | 0 |
| If incapable of contributing to earn a livelihood . | 1 | 3 to 1s. 6d. |

† As a matter of fact, the abolition of all contributions from Army pay towards pensions was not secured till late in the nineteenth century, when it was laid down that the pension charges should be defrayed by the nation from funds voted specially for that purpose.

pension according to the alleged *disability* or degree of *unfitness* for labour. In short, it is clear that the Act—so excellent in other respects—presented an obvious loophole for the *admission to pensions of men of immoral character*, and eventually it was repealed (1826).

### *Regulations to prevent Impositions*

Subsequently to 1806 a succession of Warrants empowered the Commissioners of Chelsea Hospital to extend the rates of pensions under certain circumstances (1812). In addition, by a Warrant (1818) it was established that "the rates of pension to be granted to soldiers enlisting subsequent to March 14, 1818, be in no *case higher than the rate of full pay enjoyed by them at the time of their discharge*, excluding the additional pay, if any, for length of service."

As Marshall observes: "This rule was essentially necessary to prevent *malingering*, as it could hardly be expected that a soldier would serve cheerfully and faithfully when a pecuniary prize, amounting to a sum above his pay, was to be gained by successfully feigning a disability and thereby procuring his discharge." By this same Warrant of 1818 it was resolved "that the Commissioners shall not grant pensions in respect of disability, unless such disability be stated in the discharge of the soldier to have been *contracted on service*." This rule, like the former regulation, was a measure framed for the purpose of excluding from the bounty of Government all individuals who had become disabled by causes *other than the exigencies of military service*.

### *Congestion of Pension Roll*

In truth these regulations were the outcome of the alarm occasioned by the fact that the pension list had gradually increased during a long period of profound peace. As Marshall was at pains to ascertain, a large proportion of the pensioners in 1829 "were neither old men nor suffering under serious disabilities," as may be inferred from the annual ratio of mortality: it is only between three and a half and four per cent."

Continuing, he observes: "There were in 1828, 19,000 men on the Chelsea list, whose mean age was about thirty-one years, and who received sixpence a day in consequence of alleged disabilities. During the year 1828, ninety men were placed on the out-pension list who had not served two years, or reached twenty-two years of age. A system under which soldiers could *for very short service be pensioned for life*, easily accounts for the constantly increasing numbers of pensioners. A facility of quitting the

service on false grounds, whether a man receives a pension or not, is calculated to encourage imposition, and to injure the discipline of the Army."

### *United States Alarm Act*

In short, a state of things occurred exactly similar to what ensued in the United States in 1820. As may be recalled, the first general law granting "service" pensions did not come into force until 1818—thirty-five years after the War of Independence. The recipients were required to be in indigent circumstances, and in actual need of assistance from their country. Two years later Congress became much exercised by reason of the large number of claims filed (about 8000). What was known, therefore, as "The Alarm Act" was passed—requiring each applicant for pension, and each pensioner on the Rolls, to furnish a schedule of his whole estate and income, clothing and bedding excepted. On inquiry it transpired that many of the applicants possessed as much as 150 dollars' worth of property.

While it would be ungenerous to withhold our admiration for the United States Pension Fund, we must not lose sight of the temptations it afforded to imposition. Such that, in the words of an American general, "It has come to pass that those who were merely on the Rolls for a few days and the malingerers and deserters all march as veterans of the great conflict upon a parity with the noble men who volunteered and fought to the finish." *

Nor when we revert to the experiences of our own country in this respect can we flatter ourselves that we were immune from gross abuse. Thus Marshall remarks that "of about 26,000 pensioners that were in Ireland in 1828, 6000 were, upon examination, found fit for service in the field or in a garrison; and when the pensioners who receive less than one shilling per day in Great Britain were examined early in 1831, from one-third to one-half of the whole number were found fit for military duty. In one station of 1300 pensioners which were inspected, 600 were returned fit for duty. The most surprising recoveries had taken place. Men who had been discharged as blind were restored to sight, the deaf heard, and the lame ceased to halt."

### *Recognition of Moral Depravity*

In 1829 was issued a *Revised Warrant* cancelling all existing Warrants, Regulations, etc., and in this instrument there were

* *United States Pension Fund.*—In 1899 there were 991,519 pensioners, the annual cost of pensions was £27,671,010, with office expenses of £700,000 in addition; while in 1911, forty-five years after the Americans' last great war, the annual amount paid in pensions had risen to £32,000,000.

clearly defined the conditions under which *forfeiture of pension* might ensue, and this, not only through gross malingering, but also " if a soldier shall have been convicted by the civil power of a misdemeanour or by a court martial of any *vicious or disgraceful conduct* such as to render him unworthy of belonging to the army, and consequently to be unfit for the military service." *

By the various clauses referring to forfeiture of pensions the Commissioners were invested with more discretionary powers than under Windham's Act, and in which, as before remarked, *moral depravity* did not cancel a soldier's claim for pension.

Nevertheless, despite the increased stringency of the Pension Warrant of 1829, abuses still prevailed. Thus, but a few years after the close of the Napoleonic Wars—in 1839—Gavin commented on the singular circumstance that there were then as many soldiers on the Pension List as on the Army Roll—a state of things, as he said, entailing a vast expense. Indeed, it was but too well established that at that time the Army and Navy suffered grievously from successful imposture, and in the columns of the *Lancet* of that year we find the caustic comment that the " invaliding and pensioning of soldiers has been conducted ignorantly, unjustly, and extravagantly."

### *Malingering Defined in Articles of War*

Indeed, a perusal of the Pension Warrant of 1829 clearly shows that the most varied forms of imposture were in vogue. Thus by the Articles of War, 1830 (Art. 40), " any soldier who shall be convicted of malingering, feigning, or producing any disease or infirmity—absence from hospital—protracting cure, etc., shall be tried for disgraceful conduct, and be liable to punishments attached to that offence." The fact that the crime of " malingering " was only first recognized in the Articles of War of 1830 is somewhat strange in view of the fact that it had long been accorded a prominent position in the military codes of other nations. Leaving aside the fact that the Romans took great care not to " give occasion to cowards or sluggards to counterfeit sickness," we have it that as far back as 1717 by the Dutch Articles of War the simulation or provocation of disease deprived the soldier of all privileges. How subtle and varied were the means of deception practised may be gathered from certain

* By the War Office Circular, No. 643, " disgraceful conduct " implies confirmed vice and all unnatural propensities, indecent assaults, repeated thefts and dishonesty, ferocity in having maimed other soldiers or persons, self-mutilation, tampering with the eyes, and all cases of confirmed malingering where the conduct is proved to be so irreclaimably vicious as to render the offender unworthy to remain in the army.

regulations specially designed to prevent the attainment of higher rates of pension by means of *false entry, alteration* or *erasure in regimental books or documents*; or by the *impersonation* or *false assumption* of the *name* and *character of a soldier who is or may become entitled to a pension.*

But is it to be wondered at that such fraudulent practices obtained, in view of the fact that the pension rates of pay were so disgracefully low—so low as to repel rather than attract to the colours men of good stamp? * Thus at the close of the Peninsular Wars the following pensions were awarded for specific disabilities by the Chelsea Commissioners :

| | *Per diem* s. | d. |
|---|---|---|
| Total blindness | 1 | 9 |
| A sergeant when blind | 2 | 0 |
| Loss of one eye | 0 | 9 |
| Amputation of an arm — below the elbow joint | 0 | 9 |
| Amputation of an arm — above the elbow joint | 1 | 0 |
| Amputation of an arm — at the shoulder joint | 1 | 6 |
| Amputation of a leg — below the knee | 0 | 9 |
| Amputation of a leg — above the knee | 1 | 0 |
| Hernia — single | 0 | 6 |
| Hernia — double | 0 | 9 |

Nor were the rates of pension pay much superior as laid down in the Pension Warrant of 1829, though they are remarkable for the fact that for the first time, as we believe, regard was had to the fact that the totally disabled soldier may require "the assistance and care of some other person." Another interesting feature was the regulation empowering "Commutation of Pension for a Sum of Money or a Grant of Land." This granting of land as equivalent to a pension is interesting as being hallowed by tradition from time immemorial as a reward for military service.†

The same has found recognition in the army of the United States. Thus we read that "to give title to bounty land, service must have been for at least 14 days or in a battle prior to 3rd

* As a writer of that period justly remarks: "We cannot, however, expect that a superior class of men will enter the army—viz. men with some degree of intellectual culture and a fair character for correct conduct—until the condition of a soldier be greatly improved; for this purpose his situation would require to be rendered, in time of service, in present emolument, in future provision, and in respectability, so desirable as to place him on a level in popular opinion with men of other employment."

† Whenever a grant of land is made to a discharged soldier, either in commutation of the pension or in aid of his becoming a settler, he should be exempt from the payment of any fees for such grant; the terms upon which grants to soldiers and pensioners are to be made shall be governed by such instructions as His Majesty may be pleased to give through the Secretary of State for the Colonial Department. (Pension Warrant, 1829, Art. 61.)

March 1855, and if in the Navy or Regular Army must have been in some war in which the United States was engaged. Bounty land warrants are issued for 160 acres, and over 70 million cares have been granted under the different Bounty Land Acts." Later on we shall refer to the various plans adumbrated on the Continent for settlement of the disabled soldier on land through the granting of State loans whereby the purchase of agricultural holdings can be compassed by soldiers of small means.

### *Continued Inadequacy of Pension Rates of Pay*

To resume the thread of our narrative, we may remark that the pension rates remained very low, and even at the time of the Crimean War were a reproach to any civilized nation. Thus disability pensions for *wounds* and *injuries received in action* ranged in privates from 8d. (partial disablement) to a maximum of 2s. a day (for total disablement), while their service pensions after twenty-one years in the ranks could not exceed 1s. a day (those who had served longer could obtain 1s. 2d. a day). During the latter half of the nineteenth century some slight increases in the pension rates were introduced, and the national conscience being roused by the pitiful straits to which veteran soldiers in their closing years were too often reduced, a "compassionate pension" was conferred on poverty-stricken medallists of previous campaigns who had reached the age of sixty-five.

### *State Grants to Widows and Dependents*

The tardiness with which the State recognized its obligation to *widows* and *children* of non-commissioned officers and men is a matter of national reproach. It is the more so in view of the fact that our Transatlantic brethren as far back as 1836 allotted service pensions to widows of soldiers who had fallen in the War of Independence. But not till 1863 were steps taken in our own country to rectify this unpardonable oversight. In that year the *Soldiers' Effects Fund*—an offshoot of the Royal Patriotic Fund—distributed moneys in the form of pensions to widows and children of non-commissioned officers and men—the pensions ranging from 5s. to 3s. for widows, and from 2s. to 1s. 6d. for children; and even these allowances in practice were limited to the *dependents* of those killed in action. Yet strange to say even then these meagre pensions were *neither paid for by the taxpayer nor allocated by the State.* Almost a couple of decades had to elapse (1881) before pensions were *granted directly by the State* to the widows and orphans of warrant officers, and only then for

the first time were the gratuities to widows and orphans put on the Army Votes.*

### *Elevation of Rates of Pension*

With the advent of the South African War, and none too soon, the State developed a more altruistic conception of its duty, as evidenced in the increased rates allotted. Thus for *partial disablement* a private could now obtain up to 2s. a day, and for *total disablement* 2s. 6d. a day. Identical pensions were also granted to men discharged by reason of *disease incurred through war service.* During the same war (1901) it was laid down that not only should pensions be granted to the widows and children of non-commissioned officers and men, but also to the dependents of those soldiers who—through war service—succumbed within twelve months of their discharge. Subsequently (1903) cases of death from injury were included, and the period of twelve months was extended to two years in 1902, and to seven years in 1907. The pensions for widows ranged from 5s. to 10s. weekly, according to rank, and from 1s. 6d. for each child. As before observed, up to the period of the South African War *gratuities* were the utmost that the destitute widows of soldiers slain in battle could receive from the State by the King's Bounty.

In this matter of pensions for *dependents*, the United States had long since set up a high ideal, one which, as far as these were concerned, was far more liberal in its provisions than that the South African War elicited. Thus for services rendered in the Civil War they granted—subject to certain specified conditions—pensions not only to widows and children under sixteen years of age, but also to *dependent parents, brothers, and sisters*; and, moreover, the Act has since been the subject of numerous amendments on still more generous lines.

In truth, it may be said of that great country that it stands out above all nations in its lofty and altruistic conceptions of the duties and obligations of the State to those who have suffered injury in its defence. Witness, too, the foresight and determination with which our great Ally has approached that even greater problem—the *self-realization* of those who through wounds or disabilities are more or less handicapped in their struggle for existence.

* It is at least worthy of note that almost simultaneously—viz. 1880—the State introduced the Employers' Liability Act, out of which developed the Workmen's Compensation Act with its attached right to compensation of the "workmen's dependents," i.e. such of the members of the workman's family as were at the time of his (the workman's) death wholly or in part dependent on his earnings for their maintenance.

In light of the noble example set us long since by the United States, how lamentable, how inexcusable, the tardiness of our own country in realizing the full measure of its responsibility to the disabled sailor and soldier! Its remissness is but accentuated, too, by the fact that—even in the circumscribed sphere of monetary allowances—such increases as were introduced, e.g. in the South African War, were miserably inadequate—wholly disproportionate to the measure of the sacrifice demanded.

But it were unfair to our own country to omit the comment that if the State has been too niggardly in its dealings, too forgetful of its obligations, the British public has never in this nor any previous war failed of a generous response to any appeal on behalf of disabled soldiers, veterans, and alike their widows and orphans. All honour to those who in 1803 founded Lloyd's Patriotic Fund, and later the Crimean Fund and the Sailors' and Soldiers' Help Society. Up to the present war it was to these patriotic funds, these private voluntary contributions, alone that the straitened soldier or his necessitous widow and orphans could look for aid or means wherewith to earn a livelihood. The State, like the Levite, passed on the other side, and, *mirabile dictu*, though it arrogated to itself the administration—through a permanent committee—of these voluntary funds, it remained up to the Great War deaf to its own obligations, complacently looking on at their vicarious discharge by the charitable-minded public. For, incredible as it may appear to us at the present time, it is but too true, as a recent writer has remarked, that so far as the State was concerned, "No attempt had hitherto been made to reinstate disabled soldiers in civil life or even to give most of them pensions enabling them to live as well as they might have were they not disabled." In truth, the State in this respect has been "the hardened sinner"—forgetful through the centuries of the slain bodies of generations of soldiers who "all died, not having received the promises."

## Definitions of the Term Pension

(1755) Johnson with mordant satire defined a pension as "An allowance made to any one without an equivalent." Scathing enough, forsooth, but he added the still more acrid comment that "In England it is generally understood to mean pay given to a State hireling for treason to his Country."

As subsequent happenings proved, Johnson's definition some years afterward landed its author in an unpleasant quandary. This because, later in life, he himself had a pension conferred upon him! Thereupon arose doubts in his mind as to whether,

in light of his quondam definition, he could accept this mark of royal favour. The then Lord Bute, however, overcame his scruples by observing to Johnson, " It is not given for anything you are to do, but for what you have done."

Passing now to the pages of the Oxford Dictionary we find among other definitions the following :

" A payment made to one who is not a professed servant or employee to retain his alliance, good-will, secret service, assistance when needed, etc.—a subvention, a subsidy, a fixed allowance."

" A regular payment to persons of rank, royal favourites, to enable them to maintain their state ; also to men of learning or science, artists, etc., to enable them to carry on work which is of public interest or value."

While the foregoing definitions but too clearly attest the comprehensiveness of the term pension, its elasticity of meaning, it is scant compliment to men of learning that they should be bracketed with " royal favourites " as recipients of pensions.

One turns with relief to the following definition of the term pension culled from the same source—one more in keeping with modern conceptions of what a pension is, and what manner of persons are deserving thereof :

" An annuity or other periodical payment made by a person or body of persons, now especially by Government, a company, or employer of labour, in consideration of past services or of the relinquishment of rights, claims, or emoluments."

The significance of the term *pension* as above understood is obviously comprehensive enough to include all persons deserving of such recompense. In all civilized countries at the present time the State has enlarged the sphere of its acknowledged duties and has incurred new obligations—in short, a more paternal character permeates the relationship between the State and the individual. Hence the State or other public body in all civilized lands confers pensions on its officers and servants on retirement from active service. *Also on soldiers, sailors,* and *others on being disabled in the public service,* or *on their wives and families in case of death.* Nor can the State be held niggardly in this respect when we have regard to the pensions frequently granted as a matter of bounty to aged artists, authors, etc., in recognition of outstanding achievements, or to their widows and orphans when left in straitened circumstances. Lastly, it would be unfair to omit a reference to the *Old Age Pensions* granted to workmen, or poor persons, or (as some advocate) to every one on reaching a specified age.

In reviewing these various definitions one cannot fail to note that they reflect more or less accurately serial steps in social evolution marking the upward rise to a higher level of civilization —one which takes a more and more catholic conception of the duties of the State to the individual; while at the same time increasingly jealous that its prerogatives in the matter of pensions shall be rightly exercised in the interests of the worthy, and not the unworthy.

## CHAPTER II

## GROWTH OF THE PENSION SYSTEM

### The Existing Pension Scheme

"War lays a burden on the reeling State," and again are we reminded that the law laid down by Solon still holds sway, that "persons maimed in the war should be maintained at the public charge."

Assuredly none but will gladly help shoulder the burden thus laid upon the nation—grievous though it be, and doubly so in this world-wide combat, when not armies but peoples join issue: "Multitudes, Multitudes, in the Valley of Decision."

The rolling tide of war—cosmic in its flow—sweeps o'er the earth, and with its ebb how grim the wreckage—its human flotsam and jetsam! Humanity aghast!—stands breathless—its hopes and fears poised on the gravid fateful issue: How long! How long! Aye, for with each passing hour—crescive in responsibilities—our burden grows.

In old-time conflicts—the aftermath—how infinitely less! Yet even so—to our discredit—how dimly realized our obligations! How scant the care bestowed—the maimed, the halt, the blind, too often left for ever writ "in the sad ledger of Despair"! A time-worn reproach this, which even in the sixteenth century drew from the scathing pen of Quarles that bitter epigram:

> Our God and soldier we alike adore
> When at the brink of ruin, not before;
> After deliverance both alike requited,
> Our God forgotten and our soldier slighted.

True they had that earnest of a nation's gratitude—their pension or their bounty, but with the dispensation of that dole the State felt itself assoilzied! Gratitude, forsooth, an irksome burden, to be quickly shed, not nursed. Well might the war-worn hero, stung by his country's ingratitude, with bitterness exclaim:

> And is it thus? repays he
> My deep service with such contempt?

How lamentably deaf to "the still sad music of humanity" that it could deem a monetary pittance an adequate recompense

for the loss of an eye, a limb, or part of a limb—with all that such implies—the aching void, the feeling of deprivation, and last, but not least, the sting of dependence! But what of him who in the bald ominous words of the Warrant has suffered "loss of one or more limbs," and, like Hezekiah of old, in bitterness of soul turns him to the wall!

> . . . I wait in a horror of strangeness
> A tool on His workshop floor
> Worn to the butt. . . .

*Hic jacet*—amorphous—a human remnant! Alarbus-like his "limbs are lopped"! Hideous desecration of God's image this—a Calvary of human anguish—not to be grasped, but sensed! That these things can be! Surely "they know not what they do"! Those loved lineaments, too—reft of all human semblance by some relentless missile hurtling through the blue—what of such? Surely these drink deep of the chalice of human suffering!

Men quail before such tragedies—horror striving with indignation—till pity in its surge waves all else aside. Noble the sacrifice, nobler still the dauntless fortitude of these soldier-martyrs! Godlike their unsurrender to Despair—the reflex of that perfect heroism which faces undismayed "the menace of the years"! Thus to a ransomed world they bring this further guerdon—assurance of its Higher Destiny!

Bethink us too of the widow, the fatherless, who "wild with all regret" mourn "the days that are no more." Alas, to prate to such as these of pensions or bounty savours in truth of bitter irony, and in face of this our impotence we may well see to it that if we err, we err on the side of generosity.

> How small, of all that human hearts endure,
> That part which kings or laws can cause or cure.

It is with chastening reflections such as these that we may most fittingly approach the subject of pensions. Not in the spirit of a disciplinarian—dehumanized— but as one instinct with sympathy, the milk of human kindness. As one who realizes the essentially human nature of the problem—primarily concerned as it is, not with machinery or systems, but with the lives, the happiness, of those to whom we each and all are eternal debtors.

Happily the auspices were favourable, for a new spirit was abroad—born of the travail of the nation. A quickening of the national conscience which revealed itself as a passionate desire—nay, a determined resolve—that now was the occasion for a great stride forward in moral progress, a deepened sense of our duties, our obligations, to those who had suffered in the country's cause.

The cynic may doubt the lasting quality of our crusade in the

interests of the disabled soldier. But the earnest propagandism on his behalf that now permeates all countries has in it, we apprehend, something durable that shall not pass away. For not wholly material are its aims—naught less than the *Summum Bonum*, the supreme good of those stricken in war. The very catholicity of the end sought is it not in itself a recognition of the infinite issues at stake ? The very enthusiasm with which nations have forgathered for this end—what a rebuke to those who doubt the higher destiny of Mankind, its Universal Brotherhood.

> God's in His Heaven—
> All's right with the world !

Swiftly on the outbreak of the Great War, its grim potentialities gripped the imagination of the nation, and the old-time apathy of the State towards the disabled soldier was replaced by one of anxious solicitude. The change in attitude was but the reflex of a puissant nation's awakening to its responsibilities. Stirred to its depths—aglow with sympathy—the will of the people clamoured for some definite expression of the State's purpose regarding the future of the maimed in war.

The times were not favourable to deliberate action, so swiftly were we drawn into the maelstrom of war, so bewildering the sequence of events. Yet the urgency of the situation brooked no delay. For as each successive page of " the purple testament of bleeding war " unfolded itself it became all too manifest that isolated or individual philanthropic effort, however well intentioned, would not suffice for the Herculean task, the initiation and achievement of which was clearly the imperative function of the State.

Voluntary agencies, it is true, had done yeoman service in supplementing pensions, training, and providing work for disabled soldiers, etc., in previous wars. Indeed, at this very juncture they came once more to the fore, and the immediate needs of soldiers discharged in a maimed condition from hospital were in the main provided for by Lord Roberts's Memorial Workshops and St. Dunstan's Home for the Blind. Nor must we overlook the monetary aid so generously advanced by the Prince of Wales's Fund, which in very practical fashion relieved the necessities of our crippled heroes in the anxious period that preceded the installation of State provisions on their behalf. Last, but not least, how overestimate the glorious record in those early days of the British Red Cross Society—its truly pioneer work in so many directions ! But alas, as each convoy of wounded reached our shores it became all too clear that more systematic provision was essential, and the aid of Parliament was invoked.

## The Stage of Initial Reforms

*Revision of the Scale of Pensions and Allowances*

If there be one sphere of action in which we should disdain all mercenary considerations it is in our dealings with the disabled soldier. To allow penuriousness to intrude is too contemptible. It were monstrous ingratitude to do less than our utmost. Even so, we shall be still his debtor.

Permeated by the sense of their indebtedness, the nation was in no mood to stand niggardliness—conscious as it was of the lamentable lack of a sound and adequate financial system whereby the interests of those maimed in war, and no less of their dependents, might be secured.

Parliament, accurately divining the nation's feelings and wishes in this respect, convened a Cabinet Committee to undertake the revision of the existing pensions and allowances, which it was felt were quite insufficient for a decent livelihood. Nevertheless the suggested and elevated scale was deemed by Parliament inadequate—incommensurate with the greatness of the sacrifice demanded.

Accordingly, in November 1914, a Select Committee was appointed, with Mr. Lloyd George as Chairman, and the recommendations thereof, after discussion, constituted the basis of the impending changes in pension legislation as subsequently embodied in the Royal Warrant of May 1915.

The salient innovations introduced were as follows :

(1) The rates of pension to disabled privates and those of higher rank were substantially increased, as likewise those of widows and orphans.

(2) The children of the disabled soldier were for the first time granted an allowance.

By the new scale the disabled private was assured of at least 25s. a week if totally disabled. The partially disabled man, too, was guaranteed a sum which with his earnings secured to him also a minimum of 25s. a week.

The pensions to widows and orphans were considerably augmented—a widow being, according to age, entitled to 10s. or 15s. a week, while the rate for orphans was raised to 5s. for the first, 3s. 6d. for the second, and 2s. for each additional child.

Whatever may be thought of the adequacy or inadequacy of the above scale of pensions and allowances, it cannot be denied that, judged in light of those in force after the Napoleonic Wars, they present a striking proof of the radical change in attitude that has o'ertaken the State in respect of its indebtedness to its

gallant defenders and their dependents.* As a reference to our foot-note shows, the parlous fate of the widows, orphans, and dependents—bereft of their nearest and dearest—was wholly lost sight of, while lo, how miserable the pittance allotted the unfortunate derelicts of war!

Here we may allude to the outstanding feature of the Royal Warrant, 1915, which derived importance, not so much from the inclusion of the above innovations, but that in its substance the State for the first time in its history made provision for the *treatment and training of discharged and disabled soldiers.*

### *Committee of Inquiry*

In view of the unparalleled magnitude of the war—its hideous toll of casualties—it was widely felt that, to give effect to the nation's wishes regarding the disabled soldier, steps should be taken to obtain the much-needed information as to the nature and extent of the problem.

Hasty and ill-considered action was obviously impolitic, pending clearer vision of the goal to be achieved and the means best adapted for its attainment. To elucidate, therefore, not only what was desirable, but what was feasible, and to escape the danger—a very real one in the then highly sensitive state of

* PENSIONING WARRANT, 1829: *Wounds received in Action.*—The daily rates of pensions for *wounds* or *injuries* received in *action* are to be governed by the rules contained in the following schedule:

| Rank | First degree | | Second degree | | Third degree | | Fourth degree | |
|---|---|---|---|---|---|---|---|---|
| | Men losing two limbs or both eyes, from wounds, or being so severely wounded as to be totally incapable of earning a livelihood and to require the assistance and care of some other person | | Men rendered incapable of earning a livelihood, but not requiring the care of another person | | Men able to contribute in a degree towards livelihood | | Men able to contribute materially towards a livelihood although unfit for the ordinary duties of the Service | |
| | *From* | *To* | *From* | *To* | *From* | *To* | *From* | *To* |
| | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| Sergeant .. | 2 6 | 3 6 | 2 0 | 3 0 | 1 6 | 2 0 | 1 0 | 1 6 |
| Corporal .. | 2 0 | 3 0 | 1 6 | 2 0 | 1 0 | 1 6 | 0 9 | 1 0 |
| Private .. | 1 6 | 2 0 | 1 0 | 1 6 | 0 9 | 1 0 | 0 6 | 0 9 |

public feeling—of formulating a programme without having thought out a policy, a Committee charged with this task was appointed under the presidency of Sir George Murray, G.C.B.

The results of their investigations and deliberations thereon were presented in a Report, and the following were their more salient conclusions:

It was held that the care of sailors and soldiers disabled in the war was clearly *the duty of the State.* Moreover, that for discharge of the multiple responsibilities incurred thereunder a *Central Committee* was indispensable. That the same be "empowered to act, either through the agency of the appropriate public Department, or independently, as the case may require." Also that with this centralization there should be devolution—namely, "where the circumstances justified the establishment of such an organization" Local Committees should be instituted in all parts of the United Kingdom, for the assistance of the Central Committee.

All will admit the appositeness of these suggestions. The existing machinery was in truth in dire need of *simplification.* A state of things directly attributable to failure on the part of the State in time past to realize its obligations. But for this indifference doubtless the multiple Departments responsible for the administration of the naval and military pension system would long since have been unified and co-ordinated.

As it was, the duties were divided betwixt the Admiralty, the War Office, and the Royal Hospital, Chelsea. Upon the Admiralty devolved the dual duty of dealing with all naval pensions, both *officers and men.* On the other hand, *mirabile dictu,* the War Office was responsible only for the allotment of pensions to *officers,* but those awarded to the *rank and file* were undertaken by the Royal Hospital, Chelsea. Lastly—and as it seems to us in these days almost incredible—provision for the absent soldier's family, as likewise the after-care of the disabled man himself, was left almost wholly to the charitably minded.

To their lasting credit the funds thus voluntarily raised assumed such generous dimensions that in previous wars they proved amply adequate. This largely owing to the discretionary powers vested in the Royal Patriotic Fund Corporation, which, founded at the time of the Crimean War, was afterwards established by charter and subsequently by Act of Parliament. To this corporation was assigned in trust by Parliament the charitable funds raised from time to time in aid of the disabled soldier and his dependents; while, further, it was invested with plenary powers of administration, including that of amalgamating surpluses as they accumulated. Still, despite its excellence, it soon

became apparent that the number of casualties was such that no voluntary agencies could hope to cope with the multifarious responsibilities involved in the after-care and settlement in civil life of the warrant officers, non-commissioned officers, and men disabled in the war.

The nation, however, cannot be pilloried as standing alone in its malorganization, its lack of systematic and co-ordinated provision. Similar disabilities hampered other countries in their provisions on behalf of the disabled soldier. Thus, in France, apart from voluntary organizations, no less than four Departments of the State—the Ministries of the Interior, War, Commerce, and Labour—were concerned in their treatment and training. The obvious need for co-ordination of effort was met, as in our own country, by the installation of a national system for the care of disabled soldiers.

Reverting to our own responsibilities, a glance at an official return of the discharged warrant officers, non-commissioned officers, and men disabled through the war between the outbreak thereof and January 1917, shows that there were then already 103,588 in this category, exclusive of officers and soldiers still in military hospitals. With what appalling swiftness the grim total mounts, for by April 25 of the same year the total of all ranks (including officers) who had been granted pensions on account of disability was no less than 160,056. The magnitude of these figures alone proved beyond question that the task of adequately providing for the after-care of disabled soldiers far transcended the powers of private enterprise—was indubitably the office of the State.

### *The Institution of the Statutory Committee*

Armed with the facts and conclusions drawn from the Report furnished by Sir George Murray's Committee, the Government felt itself in a position to define the responsibilities of the State, and forthwith proceeded to establish machinery to give effect to its designs.

Accordingly, in November 1915, the Naval and Military War Pensions Act was passed—notable always in that the State therein for the first time affirmed categorically its responsibility for the treatment and after-care of disabled sailors and soldiers after discharge from the Service. The chief provisions of the Act consisted in the establishment of a Statutory Committee of the Royal Patriotic Fund Corporation, and also of Local Committees.

Of the twenty-seven members of the Statutory Committee, their election was distributed between the Crown, the Royal

Patriotic Fund Corporation, the Admiralty, the War Office, other Government offices, and the Sailors' and Soldiers' Families Association, this latter having since the outbreak of war laboured unceasingly on behalf of the widows and dependents of sailors and soldiers, rendering also much help in the distribution of separation allowances. It is important, too, that we should not omit to note that it was laid down that of the members of the Statutory Committee some were to be women and others representative of Labour.

To enable the Statutory Committee to fulfil its financial obligations—supplementary grants, etc.—a sum of £1,000,000 was voted by Parliament. But it is interesting to observe that under one of the chief provisions of the Act of 1915 the Statutory Committee was empowered "to administer any funds which may be placed at its disposal by the Corporation, or by Local Committees, or by any society or other organization." The clause was a significant one, obviously implying that the intent was, not that the State should be wholly responsible, but that the public should share in the production of the necessary funds to be expended by the committee. This attempt at vicarious discharge of its duties by the State brought, as might be expected, its own Nemesis, and doubtless was one of the contributory causes which led to the failure of the Statutory Committee to realize all expectations entertained in regard to it.

### *The Aim of the Statutory Committee*

But a brief glance at the provisions of the Act of 1915 suffices to demonstrate the multiple and exacting demands made upon this important committee. It is doubtful if any other representative body was ever charged with a more catholic quest, or one more noble and altruistic in conception. Deriving its origin, and alike its strength, from the will of the people rather than from the sanction of Government, the nation looked to it to body forth its vague yet lofty aspirations—to crystallize them into a concrete well-ordered scheme.

In pursuance of their task the general principles of their policy had to be formulated in accordance with the people's ideal—viz. that the disabled sailor or soldier should ultimately, if feasible, be restored to full and conscious participation in the national life. Such implied not only achieving the material welfare of the disabled soldier—his maintenance in decency and comfort—but also ensuring him the opportunity after for exercise or re-education of his faculties, in preparation for his ultimate absorption into the active life of the community.

### *Functions and Mode of Procedure*

The lofty and far-reaching character of their aims necessarily entailed the functions of the committee being *advisory* or *co-ordinative* rather than administrative in nature. To attain their end without disturbing unduly the current of national life called for no small measure of prevision and practical sagacity. Swift decisions had to be made, far-reaching plans adumbrated, yet withal rigidity had to be guarded against, the system kept plastic, capable of being moulded to suit an ever-varying experience. *Evolutionary* rather than revolutionary was their progress towards the attainment of a well-ordered pension scheme—partaking more of the nature of a *continuous adaptation* rather than of reconstruction.

Wisely deeming the future of the nation and of the disabled soldier as one and indivisible, they sought to attain their end by *co-operative effort* rather than by State compulsion—enlisting the activities of all classes and all sections of the population. Realizing the truly human nature of the task to be achieved, they saw clearly that their line of development was, by way of experiment, discussion, and education rather than by dehumanizing the corporate action of the community through the imposition of a rigid and uniform system. Unity of spirit was what mattered, and if this were assured diversity of means was to be welcomed rather than repressed, as being more consonant with the character and traditions of the British people.

*Inter alia*, the chief functions delegated to the Statutory Committee, beyond the performance of sundry administrative duties in connexion with pensions, were :

" To make provision for the care of disabled officers and men after they have left the Service, including provision for their health, training, and employment.

" To make grants in special cases for the purpose of enabling widows, children, and other dependents of deceased officers and men to obtain training and employment."

### *Method of Procedure*

To attain the ideal embodied in the two clauses above quoted it was necessary for the committee to ascertain the national resources that could most readily be invoked to this end. It was clearly desirable that all existing institutions—built up by corporate aspirations on behalf of the health, education, and prosperity of the people—the rightful heritage of every individual citizen—should be utilized in furtherance of their aims regarding

the sick and disabled soldier. For on reflection it was clear that for many of the duties delegated to the Statutory Committee, various constituted authorities were already partly responsible.

This was especially true of the Admiralty, the War Office, the Public Health Authorities, not to mention the Red Cross and St. John Ambulance Society and numerous other voluntary agencies. To these must also be added the Health Insurance Commissioners, the Board of Trade's Employment Bureau, and the Education Department.

Now it was obvious that to deal effectively with the problem in all its bearings, and to utilize to the full the advantages resident in these various organizations, the two things necessary were *centralization of control and co-ordination of effort.* To avoid overlapping and ensure economy of effort was no easy task for the central authority—involving, as it did, the bringing into line of a multitude of Departments, public and private, and adopting them as a medium by which to achieve its ends. These onerous duties were more than enough to absorb the energies of the Statutory Committee, the primary function of which was to elaborate schemes and to lay down general principles while delegating control of the purely administrative machinery to the Local Committees which they were empowered to establish.

### *Local Committees*

None will dispute that in all problems relating to the disabled soldier the more generous affections of humanity should be allowed full scope. Who can doubt that we would fail of our end—the disabled soldier's Renaissance –if actuated only by a sense of formal duty uninspired or unmellowed by the finer sentiments of human nature? Public opinion, therefore, rightly insisted upon the State realizing that its relationship to the sick or crippled soldier must savour more of a *paternal* character, and that not merely a "cash nexus," but an element of personal solicitude and affection shall permeate all their dealings.

In this altruistic conception we find at once the *raison d'être* and alike the sphere of action of the Local Committees. To this end the central authority proceeded to secure the necessary devolution by establishing Local Committees "for every county and county borough, and for every borough or urban district, having a population not less than 50,000."

The constitution of the Local Committee was delegated to the council of the county, or borough, or urban district—subject to the approval of the Statutory Committee. The aforesaid bodies, one or other, were responsible for the election of the majority of the members. Of these same some were to be women, others

representatives of Labour. In addition, the Soldiers' and Sailors' Families Association, or the Soldiers' and Sailors' Help Society, or members of any other bodies "who have been performing functions similar to those to be performed by Local Committees under this Act" were to be adequately represented thereon.

Though governed in principle by the regulations and instructions issued by the central authority, the Local Committee enjoyed wide discretionary powers as to the exercise of its functions. They were empowered to elect *sub-committees* either for special purposes or for particular areas. Moreover, any two or more Local Committees could combine together and appoint a *joint committee* for the more adequate exercise of any of their powers or duties.

### *Functions of Local Committees*

At their inception the view taken was that Local Committees, by reason of their intimate acquaintance with the personal needs and conditions of the disabled in their respective areas, should deal with pension questions, their need of supplementation, and so forth. Such a narrow conception of their duties would have but perpetuated the ignoble idea that pensions were doles distributed over a counter. This would have been to defeat the precise purpose for which these District Committees were designed. It was no matter of mere money payments—the disabled soldier was not a recipient of charity. He had an indubitable *right* to his pension, but also infinitely more.

To give the desired human touch to their dealings the committees were required, not only to pay the men their monetary dues, but to investigate their cases and make proposals to suit each man's disabilities and circumstances. In regard to payments, in instances in which the pension was inadequate they could supplement the same from local funds, or recommend their application for such to the Statutory Committee from the central funds.

As to treatment and re-education, it was their office to be acquainted with any special hospitals or training centres in the neighbourhood where the man could obtain the particular aid suited to his needs.

All these duties implied that there should be the closest union, not only between the Local Committees and the hospitals, but between the Local Committees themselves. To procure the necessary co-operation it was decided that Local Committees should select representatives to visit all men about to be discharged from military hospitals and to furnish them with all necessary information regarding the organization which had been, and was in process of installation, for their benefit. Coincidently

it was arranged that all facts concerning the man—his circumstances, the nature of his disability, his previous trade or occupation, etc.—should be conveyed to the Local Committee of his *home* area. On transfer to his own district it devolved upon that body to arrange with the appropriate institution for his attendance as a discharged and disabled soldier so long as out-patient treatment was required.

The Local Committee has, of course, the advantage of expert advice as to the specific requirements of each individual case.

Last, but not least, the Local Committees were charged with the further responsibility of *aiding the disabled man to find employment* as soon as he had received all the treatment and training—if necessary—that he required for a new start in life. This, of course, necessitated that they should familiarize themselves with the intelligence, the measure of education possessed by the individual, and what openings there existed in civil life for the particular occupation he desired to embark upon. For it was obviously desirable that the supply of men re-educated in any particular trade should not exceed the demand, and to this end the state of the general labour market had to be carefully considered. This possibility the Statutory Committee had foreseen, and to obviate its occurrence they ordained that all Local Committees should be in close touch with the Labour Exchanges of their particular districts.

It was theirs also to cope with the particular difficulty that beset a man in gaining employment when, owing to his disability, he was incapable of doing a full day's work. Trade unions stipulating for a minimum wage, the employer in self-defence demands capability on the part of the applicant to earn the said wage. Clearly this knotty question should not be arranged otherwise than by a joint panel in which employers and workmen are represented.

With admirable foresight the Act provided for this contingency, and empowered the Local Committees to elect such bodies. This not only to guide the discharged soldier's election of a vocation, but also to decide how far, in his particular instance, the wage rules of the trade unions might be relaxed. They had, moreover, to prevent the man's exploitation by an unscrupulous employer—viz. obtaining his work at a lower rate on the ground that his pension already ensured him a livelihood. This particular danger was obviated by the panels adopting as the basis for their judgment the man's earning capacity.*

* Some cases of exploitation of disabled men by employers have recently come under Mr. Hodge's notice; for the Department, he states, is considering the question of legislation to prevent such taking place.

This brief sketch suffices to show that the ultimate success of our pension scheme rests very largely on the efficiency of the Local Committees which, on a disabled soldier's discharge from a military hospital, are responsible, not only for continuation of his treatment if necessary, but for his re-education if required, as well as for his employment on remunerative work.

* * * * * *

In conclusion, we cannot withhold our admiration alike for the excellence of the Act of 1915 and for the manner in which the Statutory Committee, as representative of the State, fulfilled the common will of the community. The object of its being was to secure for the disabled sailor or soldier a life "fit for the dignity of man." The nobility of the end placed it at once beyond the reach of controversy—above all prejudices or sectional interests. It was the duty, the wish, and the privilege of every individual to participate in the great work. How pleasing, therefore, was the absence of red tape and bureaucratic methods that characterized the activities of the Statutory Committee and its affiliated bodies! Herein it showed its true appreciation of the national character—of the British soldier. It did not endeavour so much to govern or regulate his individual effort at self-development as to facilitate and to encourage it. With statesmanlike acumen, too, they perceived that success lay, not by the path of an imposing organization, to the exclusion of that individual initiative and sense of responsibility so essential for the continuing vitality of their scheme. They have their reward in that the pension system developed, and continues to develop, naturally, not as an excrescence, but blent with our corporate life, its workings the reflex of the national wish in relation to disabled soldiers, the outcome of individual aspirations striving towards "one far-off divine event."

## Formation of a Ministry of Pensions

Notwithstanding the extreme value of the work rendered by the Statutory Committee, it was obviously but a temporary expedient—frankly speaking, an experimental investigation with no pretensions to finality. It could hardly be otherwise, hampered as it was by insufficient experience, inadequate powers, and, last but not least, its dependence on funds derived partly from Government and partly from the charitably inclined.

On the financial side the State by its subsidy having admitted its obligation, it was but natural that the public should resent its vicarious discharge, in part, by themselves, and automatically

their contribution ceased. Apart from this consideration, the old order of things must go, and the duties distributed over the Admiralty, the War Office, and the Royal Chelsea Hospital undergo unification.

Indeed, so colossal was the problem that nothing less would suffice than the formation of a Ministry of Pensions, with a Minister in the House of Commons directly responsible thereto and to the country. Consequently, in December 1916, the Ministry of Pensions Act was passed and the newly born Department entered upon its career, and none will dispute the stupendous nature of the task that confronted it—minimized though it was by the past efforts of the Statutory Committee into whose labours it entered.

### *The Process of Unification*

It was essential that, apart from actual appreciation of the aim and object of its being, its responsibilities should be defined, its powers, and alike its limitations, recognized. This to the end of ensuring effectual administration and reducing, if not obviating, any sources of friction between it and other State Departments.

As to its *raison d'être,* it is the function of the Pensions Ministry, acting as the representative of the State, to provide for the after-care of the soldier when handicapped in the struggle for existence by disabilities or infirmities attributed to or aggravated by military service. Recognition of the principle involved, as before stated, envisages, not only physical and medical treatment, but also consideration of the *vie intime* of the soldier, as likewise his training and reinstating in civil life as a self-supporting unit. When we have regard to the far-reaching nature of these commitments, the desirability—nay, the necessity—of a separate Ministry, distinct from the naval and military authorities, need not be laboured.

The primary step at unification consisted in the assumption by the Ministry of the above responsibility, *previously vested in the Statutory Committee and its affiliated organizations.*

Meanwhile, under the Ministry of Pensions Act, while all pensions granted for *length of service* remained as before in the hands of the Admiralty, the War Office, and the Royal Chelsea Hospital, all those *awarded for disablement* devolved upon the Ministry of Pensions.

### *Interrelationship with Other State Departments*

Of the various State Departments, those coming into closest relationship with the Ministry of Pensions are those pertaining

to war and labour. In other words, the new Ministry, though distinct, had on the one hand links with the Army, on the other with the great world of industry—the latter through the medium of the Local Committees working in conjunction with Employment Exchanges.

Coming more to detail: How are the functions of these various Ministries to be differentiated? For despite their co-ordinated efforts in the interests of the disabled soldier, the rôle each fulfils is yet distinct.

The objective of the *War Office* is the maintenance of military strength. Their efforts on behalf of the sick or disabled soldier are concentrated solely on the *production of efficient military units.* Automatically those unfit for military service on discharge therefrom pass forthwith under the ægis of the Pensions Ministry.

The rôle of the *Ministry of Pensions* in regard to discharged and disabled soldiers is to put them in the best possible physical condition—this to the end that they may become *efficient economic units.* In other words, its energies are expended upon men who, unfitted for further military service, may, despite their disabilities, trivial or grave, be reasonably expected to sooner or later take their place once more in civil life.

The task of the *Ministry of Labour* is to facilitate the absorption into the community of the disabled soldier as a self-supporting unit. To this end it is at present undertaking an inquiry as to what vocations offer the most profitable avenue for men who have undergone or are willing to undergo re-education.

Such, in brief, are the specific functions of the three Ministries concerned with the treatment, after-care, rehabilitation, and reinstatement in civil life of the quondam soldier.

### *Features of the New Royal Warrant* (1917)

Naturally the first departure in the way of reform by the first Minister of Pensions, the Right Honourable G. N. Barnes, M.P., was the drafting of a fresh Warrant—to consolidate and amend the provisions relating to the pensions of disabled soldiers and the dependents of those who had fallen, and this in accordance with the Ministry of Pensions Act.

To begin with, certain defects in the Royal Warrant of 1915 called for correction. Thus it will be recalled that therein it was laid down that in commuting the rate of pension some regard was to be had to the disabled man's *earning capacity.* Now clearly, neither in the interests of the State nor of the disabled soldier was it desirable that this factor should be taken into consideration in assessing the applicant's pension. This, obviously, as under

the then Scale of Allowances, the soldier when wholly disabled was entitled to 25s. per week from the State, while if partially so he obtained a sum plus his earnings which would assure to him also at least 25s. a week.

Clearly under these terms the *stimulus to work* was to a greater or less extent attenuated. This undesirable result, apart from the increased charge entailed on the State, prejudiced the man's chances of recovery. For a timely resumption of work constitutes, in many forms of disablement, the most valuable therapeutic agent we possess. A note of justice, therefore, was struck when in the Warrant of 1917 it was laid down that the amount of a pension was to be in proportion to the degree of disablement —*this without reference to the earning capacity of the recipient.*

Another step in the right direction—one, moreover, in the best interests of the disabled soldier—was recognition of the principle that *unreasonable refusal of treatment justified a reduction of pension.* But, and, as we think, unfortunately, the efficacy of this disciplinary provision was marred by its sectional application —viz. it was to be enforced only in regard to cases refusing certain forms of *medical* and *physical therapy.*

Again, in every category the *scale of payments was considerably increased.* Thus in the case of a totally disabled private the *minimum* pension was raised from 25s. to 27s. 6d., and for lesser degrees of disablement fixed at rates varying from 22s. to 5s. 6d. per week. It was laid down, moreover, that as long as a man's disability remains *in statu quo* he has a right to a fixed pension *no matter to what extent his earning capacity may increase through training or otherwise.*

In instances in which the minimum pension was deemed inadequate, or where to secure further treatment or training special allowances were indicated, the following provisions were introduced to meet the contingencies :

(1) *If the man be totally disabled and require the constant attendance of a second person, the Minister of Pensions may, at his discretion, grant him, in addition to any pension he is in the receipt of, an allowance not exceeding* 20*s. a week.*

(2) *Any disabled man, if he can show "that the minimum pension with children's allowances (if any) which he has been granted, together with the average earnings (if any) of which he remains capable, are less than his pre-war earnings, may be granted, temporarily or permanently, in lieu of the minimum pension and children's allowances, a pension which, together with the average earnings (if any) of which he is judged capable, shall not exceed his pre-war earnings up to a maximum of* 50*s. a week, plus half of any pre-war earnings between* 50*s. and* 100*s. a week.*

The last provision is, as many have remarked, somewhat involved, and as Captain Basil Williams, discussing the same, pertinently observed may be best illustrated by concrete examples, and we take the liberty of quoting those he has adduced.

"Take (A) a man with two children, who was earning £4 a week before the war and is now totally disabled :

| | £ | s. | d. |
|---|---|---|---|
| For his total disablement his minimum pension weekly is | 1 | 7 | 6 |
| For his two children he gets . . . . . | 0 | 9 | 2 |
| Total minimum weekly income . . | 1 | 16 | 8 |

Presuming he can now earn nothing, he can claim a pension of £2 10s. plus half his former earnings between £2 10s. and £4 (i.e. 15s.), making a total of £3 5s. Another man (B), partially disabled and without children, may have been earning £5 a week previously :

| | £ | s. | d. |
|---|---|---|---|
| His disablement, let us assume, entitled him to a minimum pension of, weekly . . . . . | 1 | 2 | 0 |
| While his average earning capacity is estimated at . | 1 | 0 | 0 |
| Total minimum weekly income . . | £2 | 2 | 0 |

This man can claim a pension of £1 10s. This, added to his weekly earnings, gives him £2 10s. a week. To this sum the State adds half his former weekly earnings between £2 10s. and £5 (i.e. £1 5s.). Thus his total income reaches £3 15s. a week."

(3) *Special allowances were granted to or in respect of disabled men undergoing treatment or training.* Subject to such conditions as the Minister of Pensions may determine, the man while undergoing the said treatment or training received a sum (27s. 6d.) equal to that he would have been entitled to if totally disabled. Moreover, if obliged meanwhile to reside away from home, his wife, children, or dependents draw the same allowances as they would have received had he been killed in action.

Any charges, fees, or expenses in respect of treatment or training not otherwise provided for might, subject to certain conditions, be defrayed. If the undergoing of medical treatment necessitated absence from work on one or more occasions in the week an allowance not exceeding 10s. a week might be accorded him. Lastly, if the man had undergone re-education he might on termination of the same be granted an amount "equal to a sum of 5s. for each week of the period during which he has been undergoing training."

Too much praise cannot be allotted the Minister of Pensions for the generous inducements held out to the disabled soldier to

submit to the treatment or training necessary to restore his health and to regain his capacity for self-support. In short, the Minister in these particular clauses displayed statesmanlike perspicacity in taking every possible step to prevent the soldier sacrificing his permanent welfare to his temporary interests.

(4) *In instances of disablement not attributable to or aggravated by military service* a gratuity or temporary allowance may be granted, subject to their not being due to serious negligence or misconduct on the part of the discharged man.

(5) *Pensions when disablement takes effect after discharge* may be granted, the same to be awarded from the date from which it was established that he was medically unfit for further service.

(6) In respect of widows, children, and dependents of deceased soldiers it was decreed that such provision as was made for them "shall not be claimed as a right, but shall be given as a reward of service," and that it lies within the discretion of the Minister to terminate or suspend any such pension if he should see fit so to do.

The scale of payments was elevated. For a widow the lowest rate became 13s. 9d. instead of 10s. a week, and an addition of 1s. 3d. a week was granted after the age of forty-five. For orphans the eldest child still had 5s., but the rate for the second was raised to 4s. 2d., for the third to 3s. 4d., and for each additional child to 2s. 6d. Higher rates were also fixed for the children of disabled soldiers, at the scale for orphans if the father was totally disabled, and on a proportionately lower scale according to any lesser disablement of the father.

The Warrant, too, is noticeable for the installation of *alternative pensions to widows*, temporary pensions to widows where the decease of the soldier is not attributable to or aggravated by military service, while gratuities were given to widows on remarriage. Lastly, pensions were granted to "*separated wives*" and temporary pensions to "*unmarried wives*," and likewise to "*illegitimate children*."

In conclusion, there are, of course, many interesting provisions that invite comment, such as those relating to the tenure of temporary and permanent pensions, the schedule of specific injuries, and so forth. But these being more controversial, we have postponed their discussion to the fifth chapter of this work. Still we cannot withhold the tribute that the Royal Warrant of 1917—the first framed after the installation of the Ministry—heralded the dawn of a new era in pension legislation. In the catholicity of its aims, the generosity of its provisions, the almost wistful care that neither the disabled soldier nor his remotest kith and kin should be overlooked, it voices adequately,

not only the nation's gratitude, but its resolve that the literal fulfilment of these pledges shall be exalted as a communal duty, a symbol of national renaissance.

### *The Royal Warrant of* 1918

With the absorption of the pioneer Pensions Minister into the War Cabinet his mantle fell upon the Right Honourable John Hodge, whose strenuous and assiduous efforts on behalf of the disabled soldier " he that runs may read." Like his predecessor, one of his multifarious duties was the framing of a new Royal Warrant. So comprehensive was the one of the previous year that it allowed little scope for fundamental innovations, but the Warrant derives outstanding importance by reason of the additional measures introduced to prevent imposition.

### *Disciplinary Measures*

The almost total absence of any frankly disciplinary provisions in the Warrant of 1917 to our mind constituted the salient flaw thereof. It needed but little reflection to foresee that with increasing experience the inevitable disillusionment would come, with consequent rectification of this omission.

In the interests of the State, and no less of the pension class, every effort should be made to obviate imposition either through the perpetration of fraud or laxity of administration. Consequently it was ordained that the Minister of Pensions may at any time order the review of any pension in any case where a pension has been *granted by error*, or where he " has reason to believe that a pension has been obtained by any *improper means*," or where " a pension has *by error in interpretation or fact* been granted to a disabled man *in excess of the amount appropriate to the degree of his disablement.*"

### *Increased Rates of Pension*

The most noticeable changes are those dealing with widows and children. Hence Mr. J. N. Hogge's (M.P.) definition of it as a " children's Warrant."

Alternative pensions to widows are increased from a half to two-thirds of the alternative pension that might have been payable to the husband had he survived though incapable of earning. In other words, the widow of a man whose pre-war earnings amounted to 50s. per week can now claim 33s. 4d. per week. Or if his *ante bellum* earnings reached £5 a week, the

widow will get 50s. a week. This is in lieu of the minimum pension (13s. 9d. a week for private's widow) plus the increased children's allowances. To sum up, the widow can obtain up to two-thirds of what her husband, had he been disabled and lived, would have got, instead of one-half.

The weekly grants for children for the first child were raised from 5s. to 6s. 8d., for the second from 4s. 2d. to 5s., for every other from 3s. 4d. to 4s. 2d., while for the illegitimate child from 5s. to 6s. 8d. Orphan children, the first gets 10s., the others 9s. 2d., instead of the 7s. and 6s. of the Barnes Warrant.

Parents, too, became entitled to a pension if incapable of self-support owing to age or infirmity or were in money need. Previously such pensions were given only if there had been *pre-war dependence.*

As to *disabled soldiers*, free medical treatment was to be given to men discharged for disability not attributable to Service, and during its procedure the family receive allowances. Soldiers discharged medically unfit were to receive 27s. 6d. a week, with full children's allowances until their pensions were fixed. The previous temporary allowance was 14s. a week without family allowance. If a temporary disablement pension does not run beyond a year, a gratuity of £5 was given. Discharged men undergoing training and already in receipt of a bonus of 5s. a week, may also receive a £10 grant towards tools. *Disablement pensions* for certain serious injuries also were raised. Thus a private who has lost his right arm at the shoulder was to receive 24s. 9d. a week, plus any Service pension, as against 22s. under the previous Warrant. Any earnings of which a man who has lost both eyes, arms, or legs may be capable are not to be taken into account in assessing the alternative pension, which may be a man's pre-war earnings up to 50s. a week, plus half of earnings between 50s. and £5. Pensioners re-enlisting were to have their pension in addition to pay, but no children's allowances.

### *Appointment of Medical Referees*

For the purpose of medical examination and certification under the terms of the Royal Warrant and Order in Council, the Minister of Pensions appointed local medical referees. The chief duty required of a medical referee is to examine all persons referred to him by the Local Committee or by the Minister of Pensions.

Any man aggrieved at the amount of his pension can ask his Local Committee to send him before its medical referee. In light of the opinion arrived at, the Ministry can then review the

pension. The procedure is somewhat different in "non-attributable cases" (i.e. where the man has been invalided out of the Navy or Army for some disability in no way connected with war service). In this instance the applicant can appeal to the Pensions Appeal Court (set up by Mr. Barnes and presided over by Judge Parry).

Much acrimonious criticism having found its way into the Press regarding the delay in getting a man's pension settled, the Ministry has now empowered Local Pension Committees to grant temporary allowances pending the decision of the Court. Moreover, so as to make up the arrears in hearing pension appeals, reconstitution of the Pension Appeals Court has been decided upon, and to expedite its procedure it will sit in two divisions.

Those given to irresponsible criticism of the Ministry would do well to recollect the difficulties they have to contend with. The number of men who had received pensions up to the end of April 1918 reached the huge total of 341,025. Those coming on the books of the Ministry averaged 15,000 a month, and a recent official statement by the Ministry states that "it is handling an enormous number of new pensions and allowances every week—not far short of 18,000." *

*Appointment of a Director of Medical Service*

This change of supreme importance is without doubt the outstanding innovation introduced under Mr. Hodge's Ministry. The vital problems at issue are fundamentally medical in nature. The Minister has selected Sir John Collie, M.D., C.M.G., to fulfil the exacting demands of this most responsible and onerous post. It is understood that the whole question of treatment, including both the advisory and administrative work of the Medical Service Department, will pass under the control of the Director of Medical Service. Concurrently with this appointment the Joint Institutional Committee of the War Office, Ministry of Pensions, and Red Cross (the sphere of whose activities we shall hereafter allude to) ceased to exist.

Quoting from an official source, "Sir John Collie has already made considerable progress in the formation of his Department, which will comprise the various Medical Boards attached to the Ministry, including the Chelsea Board, and the Special Boards

* The Ministry up to the end of April 19 had established in business about a thousand disabled men at an average cost of £17 13s. 4d. each, out of a voluntary fund which had been raised. Mr. Hodge has announced his intention of appealing for a sum of three millions, to establish a fund to meet certain necessities on the part of the disabled sailor and soldier which are not eligible for charge on the Treasury.

for Neurasthenics throughout the provinces. It is more important, however, to observe that the Director of Medical Service is charged with the duty of advising and directing the Ministry in

BIRD'S-EYE VIEW OF THE ACTIVITIES OF THE MEDICAL SERVICE DEPARTMENT, MINISTRY OF PENSIONS

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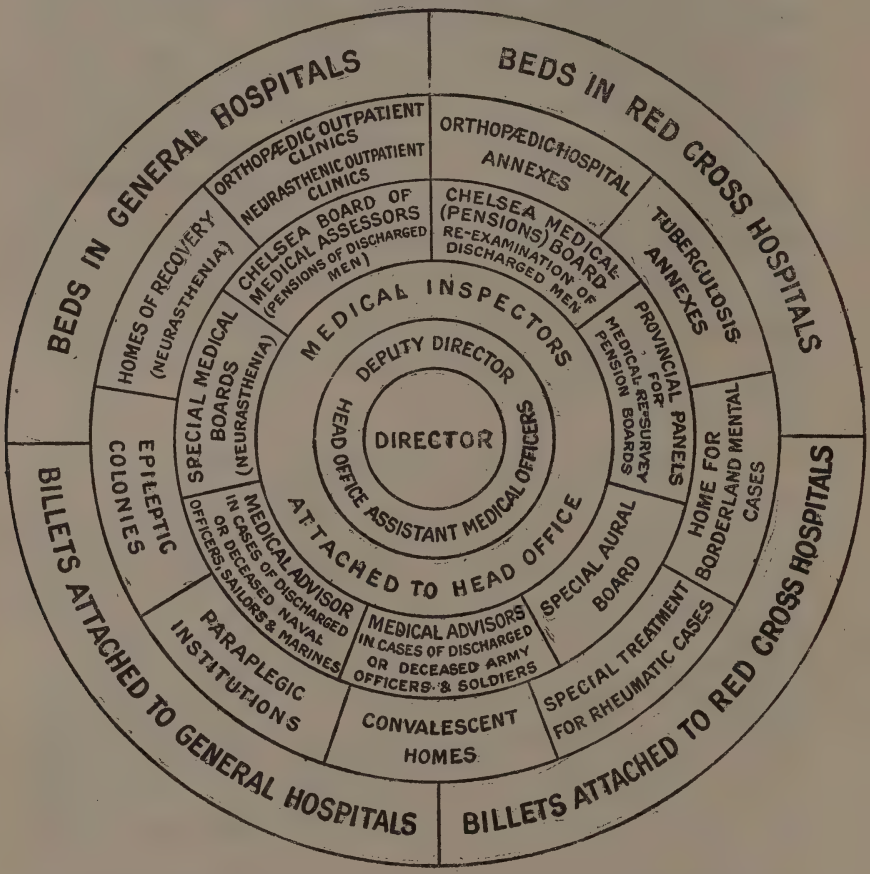

BEDS IN GENERAL HOSPITALS
BEDS IN RED CROSS HOSPITALS
ORTHOPÆDIC OUTPATIENT CLINICS
NEURASTHENIC OUTPATIENT CLINICS
ORTHOPÆDIC HOSPITAL ANNEXES
TUBERCULOSIS ANNEXES
HOMES OF RECOVERY (NEURASTHENIA)
CHELSEA BOARD OF MEDICAL ASSESSORS (PENSIONS OF DISCHARGED MEN)
CHELSEA MEDICAL (PENSIONS) BOARD RE-EXAMINATION OF DISCHARGED MEN
PROVINCIAL PANELS FOR RESURVEY
MEDICAL PENSION BOARDS
SPECIAL MEDICAL BOARDS (NEURASTHENIA)
MEDICAL INSPECTORS
DEPUTY DIRECTOR
DIRECTOR
HEAD OFFICE ASSISTANT MEDICAL OFFICERS
ATTACHED TO HEAD OFFICE
EPILEPTIC COLONIES
HOME FOR BORDERLAND MENTAL CASES
MEDICAL ADVISOR IN CASES OF DISCHARGED OR DECEASED NAVAL OFFICERS, SAILORS & MARINES
SPECIAL AURAL BOARD
MEDICAL ADVISORS IN CASES OF DISCHARGED OR DECEASED ARMY OFFICERS & SOLDIERS
SPECIAL TREATMENT FOR RHEUMATIC CASES
PARAPLEGIC INSTITUTIONS
CONVALESCENT HOMES
BILLETS ATTACHED TO GENERAL HOSPITALS
BILLETS ATTACHED TO RED CROSS HOSPITALS

Neither the position nor the size of the spaces is intended to indicate the relative importance of the various branches of the work.

matters relating to remedial treatment for disabled men in all its branches—neurasthenic, paraplegic, orthopædic, etc.—and that the performance of this duty is not being postponed on account of the essential preliminary of Departmental formation. Substantial progress has already been made in connexion with the provision of treatment for orthopædics."

We take the liberty of reproducing a chart of the manifold activities of the Medical Service Department of the Ministry of Pensions as illustrative of the immensity of the task entrusted to Sir John Collie, whose administrative capacity will here find unlimited scope. Naturally in a work of such Herculean proportions the Director will need hearty and sympathetic co-operation on behalf of those subordinated to him, and of this he may feel assured.

## CHAPTER III

## GROWTH OF THE PENSION SYSTEM—*continued*

## PROVISIONS FOR TREATMENT AND TRAINING

### Treatment of the Disabled Soldier

DESPITE the ominous portents of the coming conflict that had from time to time awoke alarm in the Chancelleries of Europe, the Great War found us unprepared. But not even when the fateful tocsin sounded did we grasp the magnitude of the struggle, much less forecast its duration. Bitterly, though too late, we rued our unreadiness. Nations, like individuals, must expiate their lapses, and yet how tragic the atonement, the sacrifice exacted!

Unready for war, we were even more so for war's victims. Such organized arrangements as did exist for dealing with the wounded and disabled did but emphasize our deficiencies. Men by battalions went down "scorched by the flames of war," and the nation had to meet as best it might the grim necessities of the hour.

Democracy, ever impatient, clamoured "something must be done," and, in truth, no time this for deliberation, but for Action. Delay in execution spelt inevitable chaos, and forthwith a process of intensive organization was set in motion. Questions of accommodation, equipment, and staff—all matters of extreme urgency—pressed for immediate settlement. This, too, with as little ruffling as possible of the current of civil life, and without interrupting the work of great philanthropic institutions and educational establishments—a disruption to be avoided in the best interests of the country.

But the nation, on its mettle, made light of difficulties. "At express speed hospitals had to be organized; medical services arranged; systems of transport created, and a mass of detail crushed into an effective method for realizing essential results." In truth, as if under the wand of a magician, up sprung hospitals, auxiliary hospitals, convalescent homes, throughout the land. In those wellnigh distracting days what a godsend the British Red Cross Society, the Order of St. John of Jerusalem, which like knights errant leapt to the rescue of the Army authorities! The

hearts of British people too, what a well of sympathy, the noblest vying with the lowliest, stately homes and manors alike opening wide their doors—objective tokens of England's love for England's sons.

But with the passing of the months we reaped the fruits of concentrated effort, the urgency diminished and attention was focussed on war's aftermath, the need of making provision for the treatment and training of discharged and disabled soldiers. Fortunately this necessity was foreseen by Sir George Murray's Committee, and by Parliament, and the necessary statutory powers for dealing with the same had been provided. It was accordingly decided that during treatment and training (if required) after discharge supplementary grants might be awarded.

## Provisions for Discharged and Disabled Soldiers

In this matter we cannot do better than quote Sir Alfred Keogh's résumé of the history of the sick or wounded man when declared " unfit for further military service " :

" (1) He is brought to a first-grade hospital in the United Kingdom for treatment by specially selected physicians and surgeons.

" (2) He is transferred to an auxiliary hospital for continuance of treatment during his convalescence.

" (3) He is returned to a first-grade hospital, and is, in due time, brought before a board of Royal Army Medical Corps officers who testify, in the appropriate documents, as to his condition, the origin of his disability, etc., for the information of the Pensions Ministry. He is visited by representatives of the Local Committee of the area in which the hospital is situated, and, by them, appropriate information regarding his condition and circumstances is conveyed to the Local Committee of the area in which he is going to reside.

" (4) When about to be discharged from hospital to his home he is given a card containing essential information, which he keeps. A similar card is sent to the Local Committee of his home area by the hospital authorities.

" (5) On arrival at his home he is visited, or communicated with, by a representative of his Local Committee and informed of arrangements which have been made :

" (*a*) For his treatment (if any) ;

" (*b*) For his re-education (if required) ;

" (*c*) For his employment (if necessary) ;

" (6) Meanwhile he is receiving a pension, the amount of

which depends upon the gravity of his disease or injury, and this pension may be supplemented, the amount of such supplementary aid depending upon the various circumstances of the man.

" (7) If his is an orthopædic case he is treated at an orthopædic hospital; if his is an ordinary medical or surgical case, either by a general practitioner or by attendance at any general civil or military hospital.

" (8) During this period of out-patient treatment he undergoes the process of re-education, in so far as he is physically fit, and at the termination of the treatment his whole time is available for re-education."

From the foregoing provisions it will be seen that, whether reviewed from the aspect of the State or of the individual, the several indications that require to be fulfilled have been adequately met. By the provision of out-patient treatment we avoid the necessity, with its attendant disadvantages, of retaining the man for an unnecessarily long period as an in-patient. On the other hand, we remove the risk, owing to unavoidable hospital congestion, of discharging a man prematurely, as though he may require further treatment it is only such as is readily available at an out-patient department. To sum up, as Sir Alfred Keogh observes :

" The State provides that the maimed soldier will be retained in hospital so long as he requires in-patient treatment, and that on discharge there is a great civil organization ready to receive him, to continue his treatment, to re-educate him, and to provide for his employment. The man is under no anxiety as to the well-being of his dependents during this preparatory period. He is not driven by necessity to return prematurely to a calling in civil life before his treatment is fully completed. When he is in the hands of the great civil and military hospitals he has the best medical and surgical advice which the country can provide. If he lives at a distance from an appropriate hospital he can be brought to live in the neighbourhood of one, or proceed there daily from his home. The State maintains him throughout all these processes, and a pension is provided on a scale already set forth."

To deal with this vast problem presented by the disabled soldier in all its aspects will far transcend the space at our disposal. Still, it would be impossible to omit allusion, however brief, to the gigantic strides that have been made in this sphere. But before passing to deal with the more striking illustrations of our progress in this direction, it will, we think, be wholly relevant if we interpolate a few observations regarding the aim and end of our therapeutic efforts on behalf of the disabled soldier.

## The True Objective of Therapy

The Great War marches to its climax, and it is but natural that attention should more and more be focussed on the intricate questions that clamour for consideration even before the longed-for peace arrives.

"Reconstruction" is now the battle-cry of the statesman. What, then, shall be its equivalent in medical parlance? Who can doubt that both for physician and surgeon alike it spells a change in attitude—in a word, "Readaptation"? Readaptation, not only to the actual exigencies of war, but to those of the new world which lies ahead. Our ideals must be readapted, must fall in line with the national trend. The change in our case but implies a *closer identification of our aims with those of the State*, an offshoot of that ever-deepening sense of national unity born of the war.

Now from the point of view of the State, what is the end-all and be-all of our office? Clearly the maintenance of national efficiency, the production of efficient *military* or *economic* units. For upon all States rests this prime obligation—viz. that the ideal life of their members shall, as far as possible, be realized, and any loss or diminution in individual efficiency obviated or provided against. Translated into practice this implies that every effort must be made to furnish the crippled soldier with opportunities of realizing the innate faculties with which he is endowed, or of developing those residual capacities which haply remain to him.

We are faced with a colossal National Debt, and if only for mere *economic* reasons restoration to functional integrity of the victims of war is not only desirable but imperative in that:

(1) It raises the productive capacity of the nation.

(2) It secures reduction in the cost incurred through sickness or disablement pensions or allowances.

*Restoration of function*—this, and not mere *anatomical repair*, is the ideal to aim at if we would guard against lessened productive capacity, with its correlated increase in national expenditure. Recognition of this, the *true objective in therapeutics*, constitutes, or should constitute, the controlling principle of all methods of therapy relating to the disabled soldier.

In some instances, happily a minority, this principle finds no sphere for fruitful application. Irremediably crippled or disabled, we can but alleviate suffering, bring a ray of light into shadowed lives that do but wait "the Great Release." To the provisions made for these human wrecks we shall allude hereafter, but for the remainder, fortunately the majority, of our disabled or crippled heroes we must take as our watchword *restoration of*

*function.* In this way only can we fulfil a tithe of our moral obligations, and how profound the economic importance, not only to the soldier, but to the nation!

That the orthopædist should long since have pursued this, the true ideal of therapy, is indeed providential when we recollect that "fully 50 per cent. of the wounded men in this war suffer from injuries, the proper treatment of which depends on the employment of methods commonly adopted by orthopædic surgeons."

## Growth and Expansion of Orthopædic Centres

"Needs there groan a world in anguish to teach us sympathy," and well may we recall this almost prophetic utterance when we contrast our former apathy with our present solicitude for the crippled soldier. Can it be denied that it took no less a stimulus than the Great War to make us appreciate the national value of the work done by orthopædic surgeons. But to its credit the nation, once alive to their beneficent activities, has seen to it that no lack of enthusiasm on its part shall cramp their energies, obstruct their work on behalf of the disabled soldier.

Orthopædic hospitals, though few and meagre, have long been with us, but they called for multiplication. The need for such was pressing, and the State, which as a rule does not erect or equip institutions for treatment, had to avail itself of those already existing, while defraying the cost of their upkeep and maintenance. The most suitable establishments for their purpose were Poor Law hospitals of modern type, or asylums which lent themselves to adaptation; while in some few instances hut hospitals were built to this end. By a thoughtful eye to their value as educational centres these military orthopædic hospitals were set up for the most part in university towns.

By singular felicity the first military orthopædic hospital was instituted at Liverpool by Major-General (now Sir Robert) Jones, C.B., R.A.M.C., this early in the war at the request of Sir Alfred Keogh. As Sir Robert Jones, Inspector-General of Military Orthopædics, observed: "It was a graceful tribute to the memory of Hugh Owen Thomas, who laid down the fundamental principles of orthopædics, that the first institution of this nature should be raised in the *milieu* of this great pioneer's most fruitful labours." In quick succession others were established at Hammersmith, and subsequently at Aberdeen, Glasgow, Edinburgh, Leeds, Cardiff, Bristol, Dublin, and Belfast, and their further multiplica-

tion is but a matter of time and the availability of a suitable personnel.

Soon it was realized that too much delay occurred in transferring suitable cases to orthopædic hospitals, and arrangements were made for their reception therein *direct from convoys*. By this more expeditious method not only are the sufferings of the patient diminished, but the period of hospital treatment is abridged, and, last but not least, many disabilities obviated that might otherwise have arisen.

For the principles of orthopædic surgery are dual—*preventive* and *corrective*. In other words, the object of the former is to anticipate or prevent deformity—of the latter to correct the same when established. Preventive orthopædics aims at removing factors which, if allowed to develop, will prejudice functional recovery. Corrective orthopædics is directed to the restoration of function when wholly or partially lost.

For the better realization of their ultimate aims—the building up of efficient military or economic units—it was essential that the organization of a military orthopædic hospital should be of a high order. It was not a question simply of *surgical operation*, which, in truth, was but a preliminary. The operation might be successful, but *was the ideal attained* ? This could only be secured by a system of *co-ordinated* effort, by enlisting the aid of experts in massage, electrical and hydrological therapy, and, last but not least, curative workshops and gymnasia, these all centred in the same institution, working all for one common end—reconstruction of the disabled soldier. All must be subservient thereto *ab initio*. The very operation chosen must be viewed in light of the subject's occupation. Thus, for example : " A soldier who was a milkman pointed out that with his elbow at a right angle he could not reach the cow's udder, and the elbow was accordingly set at an angle of about 135°." But it would be impossible to pursue through their endless ramifications the fascinating labours of the orthopædist and his indispensable allies. To exalt one at the expense of the other would be invidious and no less unfair. For the deficiencies of the one reverberate throughout the series, the success attained being exactly proportionate to the sum total of the adequacy of their co-ordinated effort.

To what a pitch of efficiency these workers have attained is illustrated by the fact that of the first 1300 patients who passed through the Shepherd's Bush Hospital, nearly 1000 returned to military duty. Sir Robert Jones, indeed, observes that a recent analysis reveals that 75 per cent. of the cases rejoin the Army.

Naturally a large proportion of the soldiers in an orthopædic

centre become *pensioners*—namely, 25 per cent. When discharged therefrom they are divided into two categories :

(1) The partially disabled who require further orthopædic treatment (Orthopædic A).

(2) Those who require a certain measure of treatment of a general kind (Orthopædic B).

### *Links with the Pensions Ministry*

The functions of the orthopædic centres have so intimate a bearing on the problem that confronts the Pensions Ministry that their close alliance is imperative. For even after discharge the disabled soldier often requires prolonged supervision, maybe for years, and the ideal to be attained is continuity of treatment from the moment of discharge to the time of recovery. To facilitate the intelligent co-operation of the pensions officials, the orthopædic authorities have intimated their willingness to indicate what further treatment the soldier may require after discharge from the centre. If accommodation permit he may continue to attend thereat as an *out-patient*, or if he require operation be readmitted and retained as long as necessary.

In short, his after-care is easily provided for if the hospital be on the same site as the out-patient centre. If not the system breaks down—viz. when cases belonging to category Orthopædic A migrate to areas remote from any orthopædic centre.

### *The Need of Pensions Hospitals*

When as at Newcastle permanent buildings have been erected in the precincts of the Infirmary no separate establishment for pensioners is necessary. But the well-known centre of Alder Hey, Liverpool, is, on the other hand, located five miles without the city—viz. inaccessible for pensioners undergoing training or engaged in civil employment. In Liverpool, therefore, as Sir Robert Jones observes, a pensions hospital will need to be erected within the city.

In other orthopædic centres such as Whitchurch, Cardiff, a similar disability obtains, and plans are now, we believe, being adumbrated to meet the necessity. When we consider the large proportion of soldiers on pension of orthopædic type it will be seen that the formation of these orthopædic pensions hospitals is imperative, and this in the highest and best interests of the nation. To allow these men to drift about half cured cannot for a moment be tolerated. How necessary, for instance, is it that a man who has undergone suture of a severed nerve should not

be allowed to pass out of sight—needing, as he does, skilled inspection from time to time. How can these and the many other cases of similar nature be provided for unless they live near to or can obtain access to an institution which provides massage, electrotherapy, and so forth, and to which they can repair at stated intervals ?

Again, how are we in the absence thereof to secure the re-absorption of such men into the community as self-supporting units ? How be able to continue the beneficent work initiated in the curative workshops through whose medium Hope has been rekindled in an almost despairing breast ?

How, may we ask, unless institutions such as these adumbrated be forthcoming—equipped with all facilities for re-education and training for a new vocation ?

That there are difficulties, financial and other, cannot be overlooked. But assuredly a heavy penalty will be exacted if we fail of our duty herein. But if we live up to our moral obligations our reward shall be exceeding great, an incarnation of our vague aspirations towards a better and nobler society.

Peace hath her victories no less renowned than war.

## Other Facilities for Special Treatment

Civil hospitals are at the service of discharged soldiers when certified as requiring further treatment, and in other instances they remain under supervision as out-patients to military hospitals. But to meet their varied individual requirements special hospitals or institutions have been established by the War Office. Their installation was clearly necessary, as otherwise no adequate provision would have been to hand for those discharged as permanently unfit, whether as maimed men, neurasthenics, epileptics, consumptives, or paralytics.

Primarily these institutions were intended to provide in-patient treatment, but their scope has now been extended to discharged soldiers who can attend as out-patients.

### *The Limbless Hospitals*

Those who have " lost one or more limbs " in their country's cause surely call for the most sympathetic consideration. Apart from their piteous pass consider the irksomeness, the discomfort, the unwelcome burden of an artificial limb.* The temptation to

* Statistics relating to the disabled in the Rhine Province, published at the time of the Cologne Conference (August 1916), showed that of 356 men who had been supplied with substitutes for lost arms, only 46 were making use of the

fling aside such is at first nigh irresistible. Yet when well fitted what a boon, both physical and mental! How often, too, does it open up an avenue of fruitful endeavour, of which perhaps all hopes had been renounced!

The initial and natural repugnance to wearing an artificial limb but emphasizes the need of studying carefully each individual case—the special features of the mutilation, the best means of developing such remnant as may remain of the injured limb. For the more thorough this inquiry the more appropriate will be our choice of the apparatus to be supplied later. But we must not forestall the course of events, for a period of probation must intervene wherein the mutilated part is, so to speak, educated for its future rôle. The residual power in the stump must be gauged and reinforced by intensive cultivation of the related muscles—to the end of perfecting their control and use of the artificial limb. Dr. Amar claims that by retraining the nerves and muscles of the stump the sensitiveness and vigour of the same can be increased to a degree hitherto unsuspected.

Given that a man has suffered avulsion or amputation of a limb, his case is reported to the Central Registry for Limbless Soldiers. Should the state of the stump indicate approaching readiness for the fitting of an artificial limb he is sent to one of the special hospitals devoted to this purpose. The type of mutilation is noted, the locality and consistency of the scar, the state of the related nerves, muscles, and bones. Careful measurements are taken in each case, and the artificial limb manufactured to exact specifications. This meticulous care is imperative. For unless specially designed with due regard to the particular mutilation, and no less the physiological or technical end in view, the apparatus may wholly fail of its end.

While being fitted and undergoing the necessary process of adaptation to the novel appendage the subject is retained in hospital, but not necessarily in idleness. For as soon as he is judged fit, he passes into the workshop. Here he submits his apparatus to a practical test, while often simultaneously acquiring skill and dexterity in some useful trade. Save in these limbless hospitals the responsibility for training or re-education rests wholly under the ægis of the Pensions Ministry. The most important of the limb-fitting hospitals is that at Roehampton, maintained partly by private benefactions with an additional

appliances; 161 men said they could not use them, 71 said the wearing of them caused too great pain, 47 said they had taken up other work for which the instruments were not adapted, while the rest were unwilling even to give them a trial.

subsidy from the State.* The most diverse trades are taught—basket-making, engineering, metal-work, motor mechanics, and driving, while for other subjects men are sent to neighbouring and technical institutions.

Professor Jules Amar, of Paris, finds that more than three out of every four soldiers who have lost a limb are capable of re-education into productive members of the community. The experience at Roehampton bears out this optimistic view. Of the 5811 who had passed through the hospital during a year and a half:

1394 were placed in employment by the hospital
2037 returned to old jobs
1783 were passed on to Local Committees for employment near their own homes

Total 5214

Though happily less common, loss of an arm is generally a far worse handicap than loss of a leg. But in this respect much depends on the personal equation—the general intelligence and education, and particularly the adaptive capacity.† For this reason legless men are easier to place in employment than armless individuals, as a reference to our foot-note shows.‡ In conclusion,

* "Cases of amputation:

"(*a*) When approaching readiness for an artificial limb to be fitted, patients are sent to Pavilion Military Hospital, Brighton; Alder Hey Auxiliary Hospital, Liverpool; Scottish National Red Cross Hospital, Bellahouston, Glasgow; Edinburgh War Hospital, Bangour; Welsh Metropolitan War Hospital, Whitchurch, near Cardiff.

"(*b*) When ready to be fitted with an artificial limb, patients are sent to Princess Louise Scottish Hospital for Limbless Sailors and Soldiers, Erskine House, Glasgow; Edenhall Hostel, Kelso; Queen Mary's Convalescent Auxiliary Hospital, Roehampton; Prince of Wales Hospital, Cardiff; Ulster Volunteer Force Hospital, Belfast; Duke of Connaught's Hospital, Bray, Co. Wicklow.

"The establishment of additional limbless hospitals at Leeds, Liverpool, and Manchester has been sanctioned."—*Recalled to Life*, No. 1, p. 316.

† Some researches in America by Frank B. and Lillian Gilbreth seem to open up a new vista of possibilities for these mutilated individuals. Under their system the cripple is regarded as the *fixed element* and the apparatus, e.g. a typing machine, is so adjusted as to fit in with his restricted capacities. In the typing machine "one of the principal new arrangements to this end enables the motions of the shift keys to be dispensed with, thereby making it possible for a legless, one-handed typist to earn a living. When provided with a dictating machine, a typewriter requiring no shift-key action, and with the rolls of paper properly attached, the writers claim that a willing one-handed worker can compete successfully with the average stenographer-typist with the old equipment, and, in a small office, handle successfully dictating machine and typewriter adding machine as well as telephone."—*Recalled to Life*, No. 2, p. 308.

‡ That legless men have more choice of trade than those deprived of an

the artificial limbs are made at the expense of the State, and the maintenance of the victims while inmates of the hospital is furthermore aided by a capitation grant from the same source. What a fearful toll modern warfare exacts may be gathered from the fact that in the report issued from Roehampton at the end of February 1917, the following astounding figures were adduced: Up to the end of February 1917 over 6000 patients had passed into Roehampton, and 354 officers at Dover House. Colonel MacLeod, C.I.E., on the basis of the report estimated that at least 25,000 men had to be supplied with artificial limbs. This entails the provision of no less than 5000 new limbs per annum, and when we reflect that these require to be kept in order and renewed for a number of years to come, some idea of the magnitude of the undertaking may be formed.

Surgeons, sculptors, and mechanical inventors vie with each other in their efforts to produce the best and most suitable substitutes for the lost limbs. But as the art is constantly advancing, and individual requirements differ, no standard pattern has yet been finally adopted, though greater uniformity has been arrived at in this respect in regard to the leg than to the arm. W. I. de C. Wheeler, discussing amputations in the *Medical Annual*, 1918, has arrived at the following conclusions: "Although a considerable improvement in the design and manufacture of *artificial limbs* has been accomplished as the result of three years' war experience, there is yet much to be accomplished before the ideal is reached. The loss of an arm remains irreparable

arm is clearly illustrated by the following statistics of employment found for men discharged from Roehampton:

*Employment found for Men who have lost an Arm*

| | | |
|---|---|---|
| Clerical | Lodge-keeper | Telephone switchboard attendant |
| Commissionaire | Messenger | Timekeeper |
| Gateman | Porter | Traveller |
| Gymnastic instructor | Railway work (sundry duties) | Ward master |
| Labour master in workhouse | Scholastic | Watchman |
| Liftman | | Weighman |

*Employment found for Men who have lost a Leg*

| | | |
|---|---|---|
| Bootmaking | Industrial work (sundry) | Printing |
| Caretaker | Liftman | Railway work (varied) |
| Chauffeur | Light duties at pit-head (for miners) | Road work |
| Domestic service | Lodgekeeper | Tailoring |
| Electrical work | Munition work | Telephone attendant |
| Engineering | Milker | Telegraphy |
| Gateman | Packer | Timekeeper |
| Groom | Painter | Vanman |
| Hall porter | Postal | Watchman |
| Hospital orderly | | Weighman |

from a utilitarian point of view, especially as regards above-elbow amputations. Given a favourable stump, artificial legs are an admirable substitute, but the production has been of necessity slow, and the supply unable to meet the demand. The desideratum is a standardized limb, so that it may be possible for a man to obtain spare parts in whatever part of the country he resides. The rate of production would be enormously increased, and the expense correspondingly less." *

## Other Institutional Facilities

A joint committee was formally constituted in February 1917, to arrange for the provision of suitable institutional treatment for men totally disabled while serving in His Majesty's Forces, e.g. paraplegics, neurasthenics, epileptics, and advanced cases of tuberculosis. The bodies represented on it were the Ministry of Pensions, the Pensions Statutory Committee, the War Office, and the Joint War Committee of the British Red Cross Society, and the Order of St. John of Jerusalem in England. The funds of the British Red Cross Society and the Order of St. John were largely drawn upon for the establishment and equipment of such institutions, but the cost of their maintenance was defrayed by the State. Experts were selected to advise the committee in regard to the arrangements for special disorders.†

* At the recent Inter-Allied Conference Professor V. Putti, of Bologna, gave a description of artificial limbs that can be used and moved by the stumps of the amputated limbs. Living energies are, as it were, drawn from the stump, and voluntary movements transmitted by allowing the muscles to overlap the bone, leaving protuberances similar in shape and size to two small fingers. Under the British system, a man, if he has lost both hands, has to depend very largely on outside agencies. But under this method he would be able to use a knife and fork at the table, dress, and even shave himself with a safety-razor. This new scientific technique is but in its infancy, though the Germans, following in the wake of the Italian surgeon, are undertaking researches along the same lines.

At the same meeting, Professor Ettore Levi (Florence) presented a report on the ultra-disabled cases of complex mutilation (blind or partially blind with double amputation of the upper limbs), and those amputated in three or four limbs. He commented on the extraordinary changes in character that ensued. "As a rule they became extraordinarily sensitive, easily irritable, susceptible on the slightest cause to profound depression, and unrestrained exaltation, morbidly jealous of one another, and subject alternatively to happiness and despair." But he adds the cheerful comment that "they were susceptible to every good influence, and rarely did suggestive persuasion fail."

† Neurasthenia . . . . . Colonel Sir John Collie
Epilepsy . . . . . Dr. C. Hubert Bond
Tuberculosis (advanced cases) . Major P. H. S. Hartley, C.V.O.
Paraplegia . . . . . Dr. R. Fox-Symons
Finance . . . . . Sir H. Haward

The functions of the committee were mainly advisory and co-ordinative, the actual management and administration of institutions being undertaken by Local Committees or supervised by Local Authorities. The numerous houses and institutions proferred as homes of recovery and of treatment were all inspected and reported upon as to their suitability, and the means available for medical care and treatment, as also, wherever possible, of supplying outdoor work and training for those patients capable of taking advantage thereof.

### *Neurological Centres*

As the outcome of our experience during the war our attitude towards the victims of so-called functional nerve disorders—shell-shock, neurasthenia, and so forth—has undergone profound modification.

Instead of, as in the early days of the war, allowing mild shell-shock cases to pass to the base and thence to England, we now realize the importance of *immediate* skilled psychotherapeutic treatment. To this end neurological centres have been established in close proximity to the fighting-line. Frequently through appropriate measures, given at the right psychological moment, the potential neurasthenic with marvellous rapidity regains his nervous stability, returning often to the fighting-line in two or three weeks.

Surely here we see the healing art at its zenith! Spellbound by the horrors of war, the soldier is stricken dumb, blind, or deaf. The avenues of sense, one or more, are closed. How bridge the "unplumb'd salt estranging sea" which ever, even in health, sunders all human entities? How chase to its lair the hidden obsession or phobia? How release the pent-up speech, how remove the spell that palsies eye or ear? How, save by "deep calling unto deep," one personality dominating the other, and of such is the work of the psycho-analyst. Truly the age of miracles is not yet past, and what a glorious vista of helpfulness has through their noble work been opened up.

But to resume: special shock hospitals, lying close to the clearing hospitals under the superintendence of a neurologist, have been furnished for each Army area. Here after two or three weeks' intensive treatment the man may be transferred to a local convalescent camp. If unlikely to recover quickly he is relegated to a base hospital. Here an important differentiation is effected, the cases being divided into two groups, grave mental cases and neurological examples (neurasthenia, functional paralysis, hysteria, etc.). Dispatched to England these two pass to

two distinct clearing hospitals. The former, as long as there is any hope of amelioration, are kept in a special military hospital devoted to such cases, and only when manifestly incurable are they discharged to an asylum. The neurological cases, if of severe grade, are sent to one of the special hospitals for nervous diseases.* Before discharged therefrom they are investigated by a special medical board presided over by Sir John Collie, some members of which are sent out to examine discharged neurasthenics in the provinces. This board, apart from the immediate examination of men when discharged, has also to examine periodically those in receipt of temporary pensions; as also to make recommendations for the final scale of pension to which each man is entitled.

### *Institutions for Discharged Neurasthenics*

Homes of recovery, as they are called, are being instituted in various parts of the British Isles. The first of these was opened at Highfield, Golders Green. It has been decided that each should have a resident medical officer in charge, and that no institution shall be officially recognized which does not provide accommodation for less than fifty beds.

Up to September 1917 arrangements had been made to provide six such institutions in England (including one for officers), one in Wales, and one in Ireland. The travelling units of the special medical board who visit the military centres in all parts of the kingdom, draw attention to the necessity for multiplication of such homes in areas where the need is obvious.

At these institutions, beyond physical or medical methods of treatment, the most strenuous attempts are made to induce an optimistic frame of mind. In short, the axiom "treat the patient and not the disease" is applied in a whole-hearted manner. Moreover, beyond suitable psychotherapy, outdoor work and recreation are insisted on.† Blessed indeed is the

* Cases not likely to require prolonged treatment are sent to the neurological centres of the Territorial Force General Hospital; the National Hospital for Paralysis and Epilepsy, Queen Square; the Hospital for Nervous Diseases, Maida Vale; or the West End Hospital for Diseases of the Nervous System, Welbeck Street, W.

Cases likely to require prolonged treatment are accommodated at the Red Cross Military Hospital, Maghull, Liverpool; Springfield War Hospital, Upper Tooting, London; Royal Victoria Hospital, Edinburgh; King George V Hospital, Dublin.

† At the recent Inter-Allied Conference, Sir John Collie read a paper dealing with homes for shell-shock cases. Hypnosis, he said, had been found of little value, and had been replaced by a system of re-education. We may add that one of the most interesting examples of re-education of nerve patients at Golders

neurasthenic who can find work congenial to him. Only in this way often can he woo back his lost sleep and remit to oblivion the horrors which haunt him.

### *Home for Paraplegics*

Surely here are cases which call for the most delicate manifestations of sympathy, for what more lamentable, more pathetic, than a man in the heyday of youth stricken with wellnigh total paralysis. Pithed and prostrate he lies. Motionless, defenceless, helpless—an incarnate *eleison*. No friendly shaft this from the quiver of Azrael, hastening slow-footed Decay, but a felon stroke nipping i' the bud the Promise of Youth. Bereft of Hope, from sweet recreation barred, the shadows of untimely Age encompass him. The spirit of Youth is fled, and oh, the sting of the might-have-beens ! To look back is torture, and to look forward " into the wastes of Time " is terrifying.

> How gladly would I meet
> Mortality, my sentence, and be earth
> Insensible !

Prior to the formation of the Institutional Committee, by the generosity of the Auctioneers' and Estate Agents' Institutes the Star and Garter Hotel on Richmond Hill was purchased and presented to Her Majesty the Queen, who in depth of devotion to all our sick and wounded is eclipsed by none. Graciously pleased to hand over this haven of refuge to the British Red Cross Society, Her Majesty intimated her wish that, subject to its control and management, the Star and Garter should be devoted to the care of discharged and totally disabled men. A right royal gift, and how beautiful the setting ! Wheeled to an open loggia the stricken soldier, though pinned to his " mattress grave," may find solace as he gazes on the beauteous scene, may, haply for one moment, " steep his senses in forgetfulness " of his piteous pass.

It was at first hoped that the well-known house would be adaptable to its new purpose, but unhappily it did not lend itself to modern requirements. The old fabric with all its old associations will soon be a thing of the past, and on its site will soon rise a building which, erected by the women of England, will for all time be dedicated to disabled, crippled, or helpless sailors and soldiers. When the old hotel has been rebuilt according to plan it will provide accommodation for 250 patients. But, unfor-

Green is the training given in the intensive culture of vegetables under frames and glass bells.

tunately, the number of paraplegics is increasing, and no one institution will suffice, and accordingly others of a like pattern are being arranged elsewhere in the country. There are already similar homes in Manchester and Glasgow.

As to the mode of procedure to be adopted in the case of paraplegics it is laid down that "the Local Committee should first ascertain whether adequate facilities for treatment exist at the nearest civil hospital, and, if not, should communicate with the Pensions Ministry, which will either find a bed for the case near the man's home, or, by the help of the British Red Cross Society, will accommodate him in one of the special institutions such as the Star and Garter Home for Paraplegics which the Society has provided."

### *Homes for Epileptics*

As might be expected, the unstable epileptic, when unhappily he has been enrolled in the Army, but too frequently suffers aggravation of his pitiable malady. So much so, in some instances, that nothing remains but to place him under constant observation, a subject for special treatment.

To meet the requirements of sailors and soldiers in such sad case the Ministry of Pensions, to begin with, established an Epileptic Colony at Chalfont St. Giles, consisting of three cottage homes, each with accommodation for twenty-five men. Here they enjoy the advantages of medical supervision by the staff of the neighbouring civilian Home for Epileptics, and reap the benefits, in them very necessary, of a healthy outdoor existence. In addition, two cottage homes, each accommodating forty men, are available at Lingfield Colony, Surrey, which is also provided with workshops. Similar provisions exist at Monyhull, Birmingham; at Maghull, Liverpool; and at the David Lewis Colony in Cheshire. Multiplication of these epileptic colonies throughout the kingdom has been arranged for, it being realized that these centres for treatment and training should be easy of access for those eligible for them. Severe cases of this nature should be brought to the notice of the Pensions Ministry, which will arrange for an appropriate course of treatment.

### *Provisions for Tuberculosis*

Since the commencement of the war several thousand men have been invalided for tuberculosis.* As soon as suspicious

* At the recent Inter-Allied Conference, Professor Vallon, in the course of a paper on "The Tuberculous Soldier in the French Army," stated that they had had 80,000 cases in six months.

symptoms manifest themselves the soldier is admitted to a military hospital, and on establishment of the diagnosis passes before a medical board and is invalided from the Army. Prior to discharge, however, if his case be but incipient, arrangements are made for his admission to a sanatorium, or if the morbid process be more advanced, to a hospital.

In the case of soldiers who are insured under the National Insurance Act, arrangements are made by the Commissioners to achieve his removal with as little delay as possible to a sanatorium. These beneficent arrangements are now being extended to all discharged tuberculous men.

Prior to discharge from hospital the man is visited by the representative of the Local War Pensions Committee of the area in which he intends to take up residence. In this way he keeps in touch with the committee, who are *en rapport* with his case, and will, if need be, afford him help. Through its medium he meets those interested, not only in finding him occupation, but who, when necessary, will guide his selection of a new vocation.

After leaving the sanatorium the subject, if insured, comes under the care of his panel doctor. If there be a relapse in his condition he is referred to the Tuberculosis Officer, who in turn will advise the Insurance Committee of the treatment appropriate for him, and whether re-entry into a sanatorium is necessary.

The *advanced* cases needing hospital treatment and careful nursing which, owing to the insufficient accommodation at chest hospitals, might have drifted into Poor Law infirmaries, will now escape this sad fate. For, by arrangement between the Ministry of Pensions and the Metropolitan Asylums Board, a number of beds have become available for such cases when coming from London and adjoining counties.

Also, with the aid of funds generously forthcoming from the British Red Cross Society and the Order of St. John of Jerusalem, the Ministry of Pensions has provided pavilions of standard type (to contain twelve beds) in the grounds of existing hospitals or sanatoria located in or near large centres of population (Manchester, Birmingham, Liverpool, Derby, Bristol, etc.).

To secure entry to one of these beds the form of " Application for Sanatorium Benefit " should be transmitted by the subject's medical attendant to the Tuberculosis Officer. If this official finds the case unsuitable for sanatorium treatment, but eligible for hospital, he communicates his views to the Insurance Commissioners. Then, if approved by the Ministry of Pensions, the latter defrays the cost of provision for treatment and procures his admission to one of the beds provided either direct or through the Insurance Commissioners.

Lastly, one cannot omit to note that the Ministry of Pensions is, in selected cases, endeavouring to supplement sanatorium treatment by dispatching them to what are known as Farm Colonies, where training would be combined with treatment. Here the art of market-gardening, bee-keeping, poultry-farming, forestry, etc., may be acquired, and the subject eventually gets back to the land—an adept in some congenial and remunerative work.*

## Training of the Disabled Soldier

Man's work is to labour and to leaven
As best he may—earth here with heaven,
'Tis work for work's sake that he is needing.

"Rest!" quoth Arnauld, "shall I not have all eternity to rest in?"—and it is in the spirit of this robust philosophy that we must approach our subject—the training of the disabled soldier. Our Evangel should be the Gospel of Labour. *Self-help,*

* Further provisions for treatment in special disorders:

*Cases of Rheumatism and Kindred Complaints*

Royal Mineral Water Hospital, Bath; St. John's Brine Bath Hospital, Droitwich; Strathpeffer Spa, Strathpeffer; Mile End Military Hospital, Bancroft Road, E. (special section for rheumatic cases); Alexandra Bromo-iodine Hospital, Woodhall Spa, Lincoln; Royal Northern Sea Bathing Infirmary, Scarborough; Royal Bath Hospital, Harrogate; Devonshire Hospital, Buxton; Royal United Hospital, Bath; War Hospital, Bath; Llandrindod Wells Auxiliary Hospital.

*Injuries to Face and Jaw*

Cases requiring plastic operation: The splendid hospital at Frognal, Sidcup, has now been opened.

Other cases: Croydon War Hospital, Croydon; Queen Alexandra Military Hospital, London, S.W.1; 1st London (T.F.) General Hospital, Camberwell, London, S.E.; 2nd London (T.F.) General Hospital, Chelsea, London, S.W.; 3rd London (T.F.) General Hospital, Wandsworth, London, S.W.; 4th London (T.F.) General Hospital, Denmark Hill, London, S.E.; 5th London (T.F.) General Hospital, Lambeth, London, S.E.; King George Hospital, Stamford Street, London, S.E.1; 2nd Northern (T.F.) General Hospital, Leeds; 1st Southern (T.F.) General Hospital, Birmingham; 1st Western (T.F.) General Hospital, Liverpool; 2nd Western (T.F.) General Hospital, Manchester; 3rd Western (T.F.) General Hospital, Cardiff; 1st Scottish General Hospital, Aberdeen; 2nd Scottish General Hospital, Edinburgh; Royal Victoria Hospital, Edinburgh; King George V Hospital, Dublin.

*Artificial Eyes*

Horton (County of London) War Hospital, Epsom.

*Heart Cases*

Hampstead Military Hospital, Holly Hill, Hampstead, London, N.W.3; National Hospital for Diseases of the Heart, Westmoreland Street, London, W.1.

not self-pity ; *self-reliance*, not self-slaughter. For nothing short of moral death, " the insupportable labour of doing nothing."

Doubtless there are extenuating circumstances, and none would belittle them. Grievous mental and bodily shock, breaking up of a wonted occupation, repugnance to taking up anew the threads of a broken life. Suffering and prolonged inaction, too, bring in their trail apathy and lassitude. But to these all, what surer antidote than Work ! Aye, Work, the sooner the better if we would stave off moral degeneration, the certain fruit of idleness. How else shall he gird his loins, fit him for the coming struggle, make ready for peace, which is " but war in masquerade."

### *The Difficulty of the Problem*

The number of disabled men is, alas, legion, but sadder still the number of those who since their discharge have undergone any training is small—" very small," laments the Director of Training to the Minister of Pensions. In all belligerent countries alike the ardour of enthusiasts has been damped by the indifference of the crippled to the proffered boon—re-education. The existing shortage of labour and the current high wages, both combined, have proved too potent, the call too seductive. Doubtless in early days necessity drove men into casual jobs, blind-alley occupations. The Nemesis was sure, and even to-day " the afflicting sight of the wounded soldier actually begging his bread (with or without a fair pretext of doing so) is again becoming not uncommon." But if it be so now, what of after the war ? These partially disabled and unskilled workers, how sad their fate ! Branded with the curse of the Incomplete, they stand idle because " no man hath hired us " !

The thoughtful foresaw this impending evil, and as desperate diseases need desperate remedies they conceived the idea that the strong arm of military discipline might be invoked. That crippled men before discharge from the Army should undergo compulsory training for some civil occupation within the range of their residual capacities. Utopian, and, as might be expected, it proved impracticable. A hospital's function is to treat and not to *train* a man, and as Sir Alfred Keogh rightly observed, " the supply of schools and teachers to the many thousands of hospitals which exist in England alone would make the process impossible."

Doubtless the fallacious idea took origin in misinterpretation of the fact that in military orthopædic hospitals a system of *curative manual* treatment has been evolved. But this we must recollect is definitely therapeutic, movements of joints and muscles for the betterment of specific injuries. Here as in

limbless hospitals the principle enunciated by Sir Robert Jones—that industrial occupations constitute an important factor in the physiological processes of cure—has been abundantly justified. By insensible gradations a man is, as it were, wooed back to work, his powers regained almost ere he is aware. Thus, as Sir Robert illuminingly observes: "A man with stiff fingers barely able to grasp even fairly large objects, is soon utterly wearied if set to grasp spring dumb-bells or any other such apparatus, but will cheerfully spend the morning grasping a big duster and cleaning windows. His mind is set on the dirt he has to remove, not on the fact that his maimed hand is repeatedly taking hold of and letting go the duster. Later, if he is a carpenter or other skilled tradesman, he is promoted to the use of tools he understands, and so the disabled hand is re-educated partly by set gymnastic exercises and largely by work."

But to resume our contention, it would be impossible to extend this practice to all hospitals, the inmates of which moreover will in the majority of instances be perfectly able to resume their former occupation. It is clear, therefore, that, except in the case of special hospitals, it is to the existing institutions of *technical* instruction that we must turn for *re-education.* In saying this we do not for one moment wish to belittle the importance and helpfulness of providing some congenial occupation, e.g. needlework, etc., wherewith to beguile the "leaden-footed hours." But, as Lord Charnwood has rightly observed: "Let us be quite clear, all this has nothing to do with technical instruction for the requirements of industry. Recreation is the aim in view."

> **Sweet recreation barred, what doth ensue**
> **But moody and dull melancholy,**
> **Kinsman to grim and comfortless despair ?**

### *The Offer of the State*

As to the financial inducements, these need not be recapitulated as these are contained under Article 6 of the Royal Warrant of 1917, and we must view the relatively liberal terms in light of the fact that in this instance "generosity is only justice adequately conceived." Nevertheless the State has been undoubtedly wise in demanding certain prerequisites.

Thus the Ministry of Pensions demands some reasonable assurance of the individual's eligibility for instruction. Also, it postulates that the proffered training shall be adequate. For they rightly wish that the teaching shall be efficient, that the man shall turn out a good workman with his heart in his work,

not bad, like Carlyle's joiner who "broke the whole decalogue with every stroke of his hammer."

As to the duration of the training, this will vary with the trade adopted. It may require but a few months, but the State is prepared to continue its weekly allowance (27s. 6d.) for as long as three years. This provided that part of this sum is contributed by the employer responsible for his re-education. Moreover, and we cannot withhold our admiration, the State, mindful of the fact that many men on discharge from the Services have rushed into some occupation without training, has elected to leave its offer for re-education open for an indefinite time. Lastly, the State rightly wishes to be assured that a man's predilection for this or that trade must be viewed in light of the fact of whether the demand for skilled men in that vocation is likely to be continuous.

### *The Facilities for Training*

It is but right to observe that the Lord Roberts Memorial Workshops, instituted some ten years prior to the great war by the Sailors' and Soldiers' Help Society, had the honour of leading the crusade on behalf of the sailor's or soldier's re-education. Space precludes an adequate description of the brilliant success achieved by these pioneer workshops. But realizing the futility of teaching any man a trade unless he could be guaranteed employment therein, the organizers decided that they would undertake this responsibility. In other words, given that a man's disabled condition prevented his obtaining work in the ordinary labour market after training, they undertook to provide him employment for life in the Memorial Workshops, and this at a standard rate of wage. *Mirabile dictu*, through their foundation on a sound basis the balance-sheets show that as an industrial concern the Central Memorial Workshops have proved more than self-supporting. Thus a net profit of £900 was the result of the first year's work after disbursement of all upkeep charges and repairs and renewals of machinery. "During the same period, with a turnover of £40,000, chiefly with the wholesale trade, no less than £16,000 has been paid out in wages."

With the exception of *consumption* and *epilepsy*, men are admitted with every kind of disability. Their wages start at £1 a week, exclusive of any State pension, and *pari passu* with their increasing skill the payment rises up to the standard rate of wage current in the district for the particular trade they follow.

Many branch workshops have now been instituted or are in process of formation in the provinces to meet the demands of

men from definite areas. Each branch has its own speciality in the way of manufacture, and if possible the work turned out is complementary to that pursued at another branch, and in this way the work co-ordinated.* The trades taught are of the most varied nature, as may be gleaned from the fact that those pursued at the Central Memorial shops in London comprise cabinet-making, joinery, carpentering, box-making, basket-making, moulding, decorating, polishing, painting, toy-making, cigarette-making, and leather-bag work.

### *Technical Colleges and Polytechnics*

The governing bodies of these institutions, not only in London, but in the provinces, are with great energy and public spirit providing training facilities for men undergoing treatment for various disabilities.

Thus for the benefit of their out-patients, when discharged from the Army, orthopædic hospitals have arranged that classes in manual training shall be run by local technical colleges and polytechnics with the additional advantage of some degree of supervision by the medical staff.

Following in the wake of those in London, classes have been started at Liverpool by the Technical Institute, in connexion with the Alder Hey Orthopædic Hospital, in typewriting, wood-carving, leather-embossing, metal lathe-work, telegraphy, cinema operators' work, cobbling, painting, and gardening. Similar collaboration between hospitals and technical schools has been instituted at Cardiff, Birmingham, and other centres.

In the same fashion, the limbless hospitals, e.g. Roehampton, etc., are closely linked up with centres of technical instruction. The London Polytechnic, working in close association with Roehampton, affords courses which include fitting, metal-turning, electrical work, architectural drawing, tailoring, etc. Major Mitchell, in his fascinating survey of the present position of training, notes the following striking examples of what can be done by sadly mutilated men after re-education: "There is a Berkshire farm labourer at Roehampton who has lost his right arm above the elbow; he is now instructor in poultry-keeping

* The branches are located in: South-Western Counties at Plymouth, South-Eastern Counties at Brighton, Eastern Counties at Colchester, East Midlands at Nottingham, West Midlands at Birmingham, Lancashire and Cheshire at Liverpool, Yorkshire at Bradford, Northern Counties at Newcastle, Scottish at Edinburgh, and Ulster at Belfast.

Mention, too, may be made of the admirable work done in the Joseph and Jane Cowen Home for the Training of Disabled Sailors and Soldiers, at Newcastle upon-Tyne.

and other matters there, and one will not easily find a more efficient farm-hand—he is not very young either. · In the physics laboratory at Eton one may meet a former gunsmith, who has also lost his right hand; he has charge of and does ordinary repairs to the delicate electrical and other apparatus there, and with his hook and his left hand he can tie knots in a fine silk thread. There is a young officer, who, before the war, played conjuring tricks; he had two arms then; he has lost his right arm too completely for any artificial appliance to be fitted on. He still plays conjuring tricks which some of us could not do with four hands (he has, it should be explained, a more useful occupation for most of his time—in fact he is now again at the front)."

Merely to enumerate the list of existing and proposed technical and industrial classes, polytechnics, and other institutes throughout the kingdom at which disabled sailors and soldiers can obtain training would run into pages. We would therefore refer the reader to the successive numbers of the magazine *Recalled to Life*. Here we would only remark that in the London area the Education Committee of the London County Council has formulated a scheme to systematize technical training for disabled sailors and soldiers. Its representatives sit periodically to consider individual cases, giving advice as to suitable training and the openings likely to be available. From the Education Office the disabled man is passed on to the Trade Panel Committee who, supervising his career in the institution selected, aid him to find employment when the necessary skill has been acquired.

Apart from the notable services rendered by *individual employers*, we have to recall that the *Aircraft Federation* have adumbrated a scheme which should furnish training and employment for at least 5000 men. The Ministry of Munitions, too, has made it known to Local Committees that disabled men, with some previous knowledge of engineering, are eligible for instruction in the more highly skilled processes—viz. tool-making, gauge-making, etc. Lastly, English and Scottish Boards of Agriculture—the latter in co-operation with large landowners—have made provisions for training in forestry, horticulture, and so forth.

### *Training for the Blind*

Those who have suffered the great handicap of blindness are fortunately relatively few, but happily for them Sir Arthur Pearson, himself blind as all know, has literally brought light to them "that sit in darkness." Since the day of small things, when some half-dozen of the heroic vanguard at Mons were

installed in a house in Bayswater, the number of blinded soldiers has sadly increased. But through the generosity of Mr. Otto Kahn, St. Dunstan's Hostel was acquired, giving accommodation to 600 blinded sailors and soldiers. There are now four annexes to the main building, and convalescent homes at Brighton, Hastings, and Ilkley, and an affiliated house at Edinburgh.

The mission of St. Dunstan's Hostel has been epigrammatically summarized by that noble philanthropist, Sir Arthur Pearson: "They come here to learn to be blind, these men blinded in our wars." By kindly and intelligent sympathy Sir Arthur kindles hope in the despairing man, opens up a bright and unending vista of possibilities which at first seem wellnigh incredible to one who deems that for him the sun has for ever set. But anon, under the guidance of blind instructors, the blind pupil begins his re-education. He follows whatever work suits him best, whether basket-making, carpentery, cobbling, or mat-making. Most, if not all, learn typewriting, others massage, or poultry-farming. He is taught to read and write Braille—his most difficult task, and which indeed some 10 per cent. fail altogether to achieve. The more highly skilled, by means of a specially constructed typewriter, acquire the art of writing Braille shorthand, and attain a speed of well over 100 words a minute.

Not the least striking feature about this great institution is the joyfulness that pervades the atmosphere. Combining play with work the blinded soldiers row, swim, dance, play dominoes, draughts, chess, and cards. Then, when the day comes for him to leave, he passes from St. Dunstan's, not only proficient, but with adequate equipment—tools and stock-in-trade—to pursue his work in life. But the watchful care of his guardians still continues. A representative of the hostel keeps him in close touch. The goods he makes are sold for him through a central depot, and with loving thoughtfulness the St. Dunstan's after-care branch watches his after-career, always nigh to give him a helping hand.

### *Training of the Deaf*

To meet the requirements of deafened soldiers the Ministry of Pensions has appointed a Special Aural Board, of which there are extensions in the metropolitan areas of the kingdom. These several areas correspond to those under the jurisdiction of the Joint Local War Pensions Committee. One or more aural surgeons are nominated to sit and act on a special aural board in these respective areas, together with specialists in lip-reading. The deaf soldiers are circularized by the Local Pensions

Committees, and invited to offer themselves for instruction in lip-reading, when considered as eligible for such. The chief difficulty met with is the reluctance of the victims themselves to take advantage of the proffered teaching. Probably when the demand for labour, even for very deaf men, and at abnormally high rates of pay, lessens, this indifference on their part may give place to eagerness. But meanwhile it is only fair to the State to recognize that the machinery exists, and that it is for the deaf man to advantage himself thereof if only he will.

* * * * * *

The foregoing remarks on the provisions for training do not purport to be anything more than an outline—a type of what is being done in replica, not only throughout the British Isles, but throughout the British Empire. In Canada vocational training and re-education is forging ahead in the most remarkable manner. As soon as all that can be done medically is done for a disabled soldier he is, after discharge with a pension, automatically transferred to the Department of Soldiers' Civil Re-establishment. This Department has the power to provide hospitals, convalescent homes, and sanatoria, vocational, educational, and other requisite training, and so forth. Each district has a vocational officer who is assisted by a Disabled Soldiers' Training Board. The finding of employment for all men returning to Canada is vested in provincial employment associations.

Turning to what is done in South Africa for the disabled soldier, all men permanently disabled in Europe are taken to the hospital in Richmond Park. On the other hand, those who have lost limbs in Africa are given the opportunity of resorting to England to be fitted with artificial limbs, and, if they desire it, of undergoing vocational training. Similar facilities are accorded disabled soldiers hailing from Newfoundland.

Again, in India, the Queen Mary's Technical School for Disabled Indian Soldiers has recently been opened in Bombay. Employment bureaux have been opened at various centres, and the Imperial Relief Fund affords help to both the men themselves and also to their families.

Similarly in Australia and New Zealand the most active efforts have been made to secure the happy re-establishment in civil life of all those whom our common enemy has sought to maim and destroy.

Nor can we forbear allusion to the inestimable value of the Inter-Allied Conferences, more especially those dealing with the training and after-care of disabled men—adding, as it does, to the common stock of knowledge in all countries, both as to the

means of saving life and teaching broken men, not only how to live, but to be happy and useful.

## The Obtaining of Employment

In dealing with this question it is highly important that we should take a very broad view of the requirements of disabled sailors and soldiers. We must bear in mind the varying mental capacities of the men concerned, seeing that in the Army of to-day men of all grades are represented, the labourer fighting shoulder to shoulder with university graduates and professional men in the highest walks of life. All these, despite their varied intellectual and physical capacities and proclivities, must be, as far as the national finances permit, adequately provided for, and every opportunity afforded them for fruitful and congenial employment.

Fortunately we have every reason to hope that through the close co-operation of the Ministry of Pensions and the Ministry of Labour the difficulties of this intricate problem will be adequately solved. Disabled men physically fit to enter the ranks of ordinary industry have the Ministry of Labour whereto they may apply for assistance in obtaining employment. On the other hand, disabled men requiring employment of a more or less unusual kind, and demanding special conditions, will have ready and intelligent help willingly proffered them by the Local Pensions War Committee.*

The general attitude of the Labour Party towards this question is a matter for gratulation, strongly favouring as they do the opening up of every possible avenue of training for men who desire to avail themselves of it. As Mr. G. J. Wardle, M.P., observes: "Subject to there being no diminution in the standard of living, or possibility of the disabled man being used to defeat the legitimate objects which the Trade Unions have in view, the Trade Unions are not only sympathetic, but desire to assist the disabled in every possible way to secure employment on remunerative work."

They look askance, and rightly, at any inflation of the numbers of *half-skilled* men, their influence being solidly in favour of

* In a paper read by Mr. J. S. Nicholson of the Ministry of Labour at the recent Inter-Allied Conference, he adduced the following facts: "Between April 1915 and March 1918, 204,083 discharged men had been registered in the divisional areas of the Employment Department, and 95,983 had found through the Exchanges their first civil employment. Thus about 50 per cent. found their first employment in this way. The remaining 50 per cent. was made up of men who were able to get employment through their own efforts, and those who found they had not sufficiently recovered to take employment."

the most thorough training. In view of the special needs of disabled men they have consented to reduce the period of apprenticeship customary for boys—of five or seven years—to periods of three years, and in some cases considerably less for adult disabled men.

In a great number of trades the Ministry of Labour, at the request of the Ministry of Pensions, has formed joint committees of employers and employees to consider training in relation to prospects of employment.

The reports of these trades advisory committees embody agreements, drawn up between employers and workpeople, to regulate conditions under which disabled men are to be admitted to the trade.*

If we may make a suggestion we trust that the trade unions will not insist that a man—slightly incapacitated, but still able to do a little—shall not be allowed to work at his bench except at the full wage earned by those who have not been injured in the defence of their country. If there ever was a case for relaxation of rules it is in that of the disabled soldier. We say this, though quite aware that the maintenance of standard rates of wages is so vital to trade unions that they cannot be expected to set it aside lightly. Nevertheless it will be deplorable if any technical difficulties are permitted to hamper the absorption of partially disabled men into the industrial community. A loafing existence on a pension has a most pernicious effect, and the less virile type of men will but too readily justify their indolence on the ground that they are not able to earn the standard wage demanded by their union. Lastly, trade unions should never overlook the fact that useful work is the best restorative for disabled men, for it helps them to regain their physical health, and, what is more important, their self-respect.

* Reports upon openings for disabled men have now been issued by the Ministry of Labour in conjunction with the Ministry of Pensions for the following trades: (1) Attendants at electricity sub-stations; (2) cinemas; (3) tailoring (retail bespoke); (4) agricultural motor-tractor work in England and Wales; (5) furniture; (6) leather goods; (7) hand-sewn boot and shoe making and boot and shoe repairing; (8) gold, silver, and jewellery, and watch and clock jobbing; (9) dental mechanics; (10) aircraft manufacture; (11) wholesale tailoring.

It is hoped that similar reports will appear in a short time in connexion with the following: (1) Engineering; (2) printing; (3) building; (4) boot and shoe manufacture.

"It is satisfactory to be able to record that, with one exception, all the skilled Trade Unions have readily agreed to admit disabled men, and even in the case of the one exception it seems likely that the Union in question may alter its previous decision."—*Recalled to Life*, No. 3.

## Land Colonies for ex-Soldiers

"The land for the people" will be a very loud cry after the war—one reinforced by the fact that the allotment movement has created some two million land-reformers. The proposal to find land for ex-soldiers is but an extension of the idea underlying the Small-Holding Colonies Act of 1916 and the Amending Bill now before Parliament. The purpose is to increase by ten times the amount of land to be acquired for the purposes of the original Act, which included the settlement of discharged soldiers. It is recognized by the Government that provision must be made on a generous scale, ultimately probably far exceeding that at present adumbrated—viz. 60,000 acres in England and Wales, and 20,000 in Scotland. The time of demobilization will probably see the foundation laid of a large peasant proprietary, under State support and encouragement, consisting of ex-soldiers who have elected to settle at home instead of emigrating to one of the Dominions.

In regard to this project of placing some of the disabled upon the land, some of the smaller ventures in this direction, e.g. market-gardening and poultry-keeping, seem bright with promise. It is probable, too, that the power already possessed by the Board of Agriculture of the taking up of land for experimental holdings will be more and more exercised in the interests of disabled soldiers. In the neighbourhood of the Humber Estuary, through State aid, a considerable area of hitherto waste land has been reclaimed for small holdings. Ex-soldiers who have settled thereon, it is intended, shall enjoy the benefit of credit banks and of co-operative buying and selling.

Arrangements have been made, too, in the Overseas Dominions for the provision of land for returned sailors and soldiers. In Canada a Bill is before the Legislature under which 160 acres of land, with advances up to £500, may be granted to returned sailors and soldiers of the Canadian Expeditionary Force, or of British or Colonial Naval and Military Services, and to former residents of Canada who have served with the Allies. Similarly, in Australia and New Zealand liberal inducements of the same nature are being held out to sailors and soldiers, and in some these privileges have been extended to their dependents.

## The Cost of Pensions

Generosity, not *prodigality*, should be our watchword in pensions expenditure. For, as the Select Committee on National Expenditure rightly remark, "there is a grave danger that a

National sentiment of benevolence and sympathy may cause a system of war pensions to expand into a widespread system of excessive or charitable grants at the expense of the taxpayer."

While deprecating any suggestion of meanness we would remark that in those cases falling short of *total* disablement a pension, however well deserved, should not be of such an amount as practically to take away all incentive to work. In other words, that where a man is still capable of work the pension should be such as to stimulate him in his own interests to better his condition, and not be such as to tempt a man to renounce forthwith all attempts to lead an active life, which, in the interests of the community, should be the aim of right-minded people in every walk of life.

The Select Committee above alluded to rightly view with alarm the proposal in some quarters "to make the present high prices of commodities a basis for fixing the rates of permanent pensions, many of which will perhaps be payable for forty or fifty years after prices have settled to what will be their normal level. Likewise the suggestions that all women should be pensioned whose husbands have died while in the Army, "although their death has been proved not to be in any way due to Army Service, and to pension parents as compensation for the loss of sons where there was no dependence or prospect of dependence."

Great as are the resources of the country, the necessity for economy in administration cannot be too strongly or too frequently emphasized. The greater the size of the pension list the more obvious the necessity for proper management.

### *Actuarial Estimates*

Sir Alfred Watson states that the total cost of pensions and gratuities under the new Royal Warrant and Order in Council is likely to be £36,400,000 in 1918–1919, and £41,500,000 in 1919–1920, exclusive of expenditure on "after-care" (treatment and training) and the cost of administration. Allowing for the possibility that in actual administration the estimate will be exceeded, and for the increase of liability arising from the acceleration of grants to discharged men of low physical categories—estimated to cost not less than £1,000,000 in the present year—it appears that, even apart from the further charges which the protraction of the war will bring, the total cost of pensions and gratuities in 1919–1920 will not be less than £45,000,000. Sir Alfred goes on to estimate that in 1930 the charges will have sunk to £40,000,000, and that every succeeding decade will show

a reduction of £10,000,000, though even in 1970 they will not have wholly disappeared.

For ourselves, we trust that these forecasts will be fulfilled, but, from data to be adduced in a coming chapter regarding the experience of our American Allies under their pension system, we must admit to misgivings. As to the capital sum represented by the liabilities at present in sight in respect of officers, non-commissioned officers, and men, Sir Alfred calculates that they may be put at little less than £750,000,000 exclusive of the cost of administration. He further observes that "this sum must not be taken as representing the amount of which the interest earnings will meet the annual charges, but is the amount which, if invested at the beginning of the war at 4 per cent., free of income tax, would have sufficed, with its interest earnings, to meet the pension and other charges (exclusive of administration) and would have been exhausted concurrently with the death of the last pensioner!"

It is further emphasized that this capital sum relates only to the liabilities in sight, and will inevitably be increased to an unknown and possibly large extent, according to the measure to which the duration of the war will be still further protracted. Also we have to recollect the further charges that will fall due in respect of disabled men, not only on demobilization, but at any time afterwards on the ground of disablement or impairment of health attributable to or aggravated by military service.

These colossal figures speak for themselves, and after the recent revelations concerning the Munitions Department, it need scarcely be observed that, great as are the resources of the country, it is incumbent that the administration of the pension system be vigilantly and continuously supervised by the Treasury, and that those responsible shall realize their duty, not only to the disabled soldier, but also to the taxpayer—the State.

## The Ideals of the Ministry

Fortified by the world-consciousness of great things to be accomplished, this newly fledged Ministry takes heart of grace and boldly proclaims its aspirations—the *renaissance* of the disabled soldier.

The ideal here enshrined is not to be interpreted in a narrow or restricted sense, as of one paying allegiance to the letter of the law rather than to its underlying spirit. It is not to be attained by mere *monetary* consideration, nor yet by purely *medical* ministrations. All-important these—still but ancillary to realization of the larger aim.

Not simply *physical* restoration of the disabled soldier—nay, more, infinitely more, his restitution in the highest and noblest sense as an integral and valued unit of the social community.

No sinecure, this task of the Ministry, but in a very real sense novel, exacting, and, moreover, enduring. It comprises the pursuit of an ideal—" the science of the ideal involved in human life." Not purely medical, but more complex, rather *medico-ethical*, the problem here presented. For in regard to the disabled soldier the ethical end sought by the Ministry is his *self-realization*. This, not in an egoistic, but rather in an *altruistic* sense. In other words, that while the disabled soldier, like every man, must " work out his own salvation," he must do so in light of the further truth that we are " members one of another." The individual goal he seeks must not be in opposition to the general good of society—the welfare of the State.

Not the least of the many difficulties imposed on the Ministry is and will be reconciliation of its duty to the disabled soldier with its responsibility to the State. Who can doubt that frequently in the maze of opposing interests they will be confronted with the same dilemma as bewildered Blanch in *King John*?—

> Which is the side that I must go withal?
> I am with both: each army hath a hand;
> And in their rage, I having hold of both,
> They whirl asunder and dismember me.

Again, the Ministry having, *qua* the disabled soldier, proclaimed as its ethical end *realization of his rational self*, the following question arises: Are the existing conditions of society those best calculated to promote achievement of that aim? This being so, it is incumbent that those entrusted with the administration of pensions recognize with Aristotle how intimately interwoven are the problems of ethics and *politics*. They must view all political innovations in light of their influence on the self-development of the disabled soldier. To discharge adequately this duty the Ministers must be men of wide sympathies and practical sagacity, in intimate touch with men of different grades, and, if possible, experienced in affairs.

Man, as Aristotle long since observed, is essentially " a political animal," and as a succeeding chapter renders but too clear, the relationship of pensions to politics is most intimate. Thus the degradation of the United States Pensions Scheme was directly and in large part attributable to lack of adherence to the enlightened policy at first outlined. The ideal end—the succouring of the disabled soldier and his dependents—became blurred, sub-

ordinate to the purely political aims of statesmen, the sport of chance combinations of party politics.

The Ministry, therefore, must have a keen eye for political sophistries, must pursue single-eyed their noble aim, contending ruthlessly against the intrusion of any political factors that might obscure their ideal and eventually undermine the integrity of the pension system. Loud affirmations that they will not permit party exploitation of the disabled soldier will not alone suffice ; such are but "sounding brass and a tinkling cymbal," for the decision lies with the electorate, and "except the people have vision they perish." It lies with those responsible to impart to them that clear-eyed vision which shall alone ensure the stability of the pension scheme.

Moreover, in endeavouring to secure for the disabled soldier opportunities for self-realization they must watch jealously, not only political, but *economic* developments. Are they such as to encourage the individual to live at the highest human level, or is the supreme end to be subordinated to the achievement of mere material prosperity ?

They must view trade and industrial innovations from a lofty standpoint—not one based on national output, but by the manner in which they affect human life. Do they lead to development and enrichment of individual life ? Do they accord with our avowed attitude and purpose in regard to the future of the disabled soldier ?

Taking upon themselves, too, the grave responsibility of guiding those who, in consequence of mutilations, etc., have to begin their lives anew, it is incumbent that they be alive to the *ethical* aspects of *re-education.* They must see to it that in the retraining of disabled soldiers they evoke and strengthen those qualities which make for good and upright citizenship. Who can estimate the chance here afforded of influencing the moral habitudes of thought and action, the *ethos* of our people ?

But assuredly, though born late in time, the new Ministry started under happy auspices, with, as its *vis a tergo,* the massive enthusiasm of a great and generous people, aglow with fine purpose, keyed up to the spirit of high endeavour ! Surely the Ministry may be of good heart, having for its earnest of success this renaissance, this quickening of the national spirit, which irresistibly recalls the prophetic vision of England's greatest poet :

"*Methinks I see in my mind a noble and puissant nation rousing herself like a strong man after sleep, and shaking her invincible locks. Methinks I see her as an eagle mewing her mighty youth, and kindling her undazzled eyes at the full midday beam.*"

## CHAPTER IV

## SOME ASPECTS OF PENSION LEGISLATION

ROYAL Warrants in quick succession rise, and it seems unlikely that the series is yet exhausted. Palpably tentative, hardly purporting, much less professing, to be comprehensive and final, who can doubt that each marks, so to speak, but a stage in the evolution of our conceptions regarding the legislative policy that should be pursued in relation to pensions ? Doubtless this piecemeal or gradative process of development is in part referable to our unpreparedness, our blindness to the impending world-tragedy.

The relatively small size of our Standing Army, as opposed to that of Continental countries, was an index of our faint realization of the contingencies attaching to a world-wide conflict. But with our transmutation into a "Nation at Arms," and our entry into the shock of battle, we came face to face with its tragic aftermath, its *colossal* responsibilities.

In light of this can we wonder that the ever-changing exigencies of the Great War have necessitated a continuous adaptation of the Pension Warrants—their constant readjustment to altered and altering conditions ? This expanding sense of our obligations is reflected in their changing tenor, their progress from relative crudity to approximate definitude and comprehensiveness.

The present fluid character of our pension policy—to a large extent unavoidable—while it has advantages, has also drawbacks. Our non-arrival at a stage at which the method of procedure can be reduced to a well-organized definite system, leaves us exposed to many vicissitudes. We stand, therefore, in grave danger of a pension legislation dictated largely by *opportunism*. In other words, that those responsible for enactments in this sphere are open to the risk of being dominated by the conditions prevailing at this or that particular period. Can it be doubted, for instance, that their course of action will be influenced by the particular political party in control, the state of the Treasury, and the greater or less imminence of an election ? The peculiar sensitiveness of modern democratic Governments to agitation is not in this respect reassuring. Any show of vacillation or infirmity of purpose on their part, what does it portend ? Simply that sectional interests, under the cloak of solicitude for the disabled

soldier, find an opportunity therein to further their own aims. In short, the dictates of an untrammelled enlightened pension policy run the risk of being coloured, possibly quite innocently and unwittingly, by the prejudices and ambitions of particular classes and groups, if not frankly worse—viz. subordinated to the base promptings of political expediency.

If, therefore, the shaping of our pension system is not to become the sport of chance or liable to be deflected from its true aims by sectional interests, it is imperative that the authorities shall, as soon as feasible, seek to evolve a pension system at once constructive, definite, and final—one based on the findings of cumulative experience. It should not, we think, be beyond the capacity of experts to frame a measure which, while generous in its provisions for the disabled soldier, shall be equally alive to the necessity for discrimination, the need of discipline, and the maintenance of a high level of moral responsibility, to the end of obviating that Nemesis of all pension schemes—*social corruption.*

The call for such is the more urgent in that students of the United States pension system seem almost unanimous in referring the abuses incidental thereto to the nature of the legislative policy " which has for nearly thirty years been steadily followed in regard to it—a piecemeal instalment-plan policy gradually assuming shape through an ill-considered succession of progressive 'blanket-bill' enactments!" That this criticism is well founded will, we venture to think, be rendered but too clear in our coming discussion of the dangers that beset the stability of pension administration through political sophistry.

## Possible Sources of Corruption

Sad but incontrovertible is it that in the wake of all altruistic legislation Corruption ever lurks in specious guise! Especially insidious are its workings when the embodied spirit of a great people bursts forth, impatient of restraint, in boundless gratitude to its deliverers. But it is then, even then, when every noble impulse impels to sympathy without stint and running over, that both the State and the public must beware lest generous affections be exploited, lofty sentiments debased—their place usurped by sickly sentimentalism.

For of all mortals, said the Sage of Chelsea, the most barren is the sentimentalist: " Granting even that he were sincere and did not willingly deceive or without first deceiving himself, what good is in him? Does he not lie there a perpetual lesson of Despair and type of bedrid valetudinarian impotence?"

" Save me from my friends!" may well be the cry of the

discharged soldier, disabled or not, if men of this ilk set themselves up as his champion! Ill-disciplined and irresponsible, with a fine disregard of the public *morale* and no less the public purse, it is they and they only who, it would seem, have the soldier's welfare at heart, who gauge the true measure of his sacrifice! Prudence in their eyes is but a mask for niggardliness. Discrimination, the basis of sound administration, but a plausible evasion of our responsibilities, and in a fine frenzy they denounce the nation's ingratitude!

It is to the rhetorical outpourings of such as these that the abuses of the United States pension system may be traced—the explanation of which, as one of its countrymen recently observed, "involves one of the most humiliating chapters in American history."

Commenting on their chicanery—their distortion of the facts—the author quoted (an active participant in the Civil War) recalls the debate on the so-called Fuller Bill (January 10, 1911), their impassioned utterances on behalf of another "blanket Bill" "of the customary indiscriminate kind, raising existing pensions in a lump and to an extent which would constitute an additional fifty million draft on the Treasury."

As the writer from whom we quote, continuing, observes: "Those engaged in the war are uniformly referred to in somewhat stilted terms as 'veterans' and 'heroes'; as being 'battle-scarred' and invariably as 'deserving and worthy'; men who enlisted at the call of duty with no thought of emoluments or pension. They were patriots then and they are patriots now"; and so forth and so on! Furthermore, they are uniformly described as "old and infirm, some blind, some crippled, some bedridden; most of them poor and many destitute." It is furthermore alleged of them as a body that those who are not dependent on others or the public for support constitute "so few exceptions as to be negligible." As he caustically observes: "To those who themselves personally took part in the struggle none of these statements or implications commend themselves. They are simply absurd in their exaggeration."

In light of these revelations, is it not well for us to be advised betimes of the tactics of such political *intrigants* who, under the cloak of a patriotic concern for the rights of pensioned soldiers, would exploit the sympathies of the public for party ends? We must be forearmed lest we be hypnotized by their insidious bids for popular applause. Subtle indeed are the machinations of these *agents provocateurs*. "Stir up the feelings!" is their rallying cry: "smother the 'still small voice' of reason, and to the winds with prudence!"

Already in this country are they afoot to gain possession of the public ear by cant phrases, eager to hold up the nation to obloquy as

A huge-sized monster of ingratitudes.

Like their prototypes in the United States they fight shy of facts, they have no love of accuracy, it curbs their rhetoric, restricts their range of evil suggestion. But nevertheless, whatever error we as a nation fall into, let it not be into the folly of despising political charlatans—their power of duping the public. For to their evil propaganda, their shameless appeal to cupidity, their spurious patriotism, may be traced that discreditable anomaly in the United States pension scheme—viz. that side by side with the *steadily decreasing number of Civil War veterans* we find, not a decreasing, but a *steadily increasing expenditure on pensions.* Thus: "In the year 1866, that immediately following the close of the Civil War, the national appropriation for the payment of pensions, though supposedly covering, under existing legislation, cases of wounds and disability therein incurred, amounted to a little in excess of $15,000,000 annually. Forty-four years later, in 1910, the exact amount reported as expended under that head lacked less than a trifling $16,000 of $160,000,000. In other words, fifty years after the close of the Civil War the pension payments because of that war, having increased in volume tenfold, were still on the ascending grade."

### *The Deflection of Pension Funds into Unauthorized Channels*

It may be recalled that one of the chief difficulties experienced in the administration of the National Insurance Act was the widespread ignorance that prevailed in regard to the principles of insurance. It became clear that many of the claimants failed to grasp the elemental fact that National Insurance was not a *charity.* All they seemed able to appreciate was that they had paid contributions, and this, they stoutly maintained, invested them with the right to obtain something out—oblivious of the fact that *industrial incapacity through sickness or bodily or mental disablement is the only legitimate plea.*

Now is there not a very real danger that the discharged soldier may become imbued with similar misapprehensions in regard to the conditions that entitle him to pension? In light of the above findings can we blame him if he perhaps fail to realize that *only if his disability or infirmity be attributable to military service is he eligible for pension*? Having "done his bit," what more natural than that he should, in light of his

patriotic services, expect a *quid pro quo*? Or that when in later years he haply fall on evil days he should deem it the duty, and alike the privilege, of the State to sustain him in his old age?

In view of the likelihood that these misconceptions may attain prevalence, it is, we think, highly desirable that the fundamental principle governing the award of pensions should be clearly defined and emphasized by those responsible for the administration of pensions. This if only to prevent the exploitation of their ignorance of the public for party ends—and what a weapon to their hand—"self-interest," the ruling passion of mankind!

### *Pensions not a Reward for Patriotic Services*

*As we apprehend it, a Military or Naval pension is a payment made as part compensation for wounds received or disease contracted in the service of one's country.*

It does not purport to be a reward for patriotic services. For how measure our indebtedness to those "patriots who for sacred freedom stood"? Such services have no financial equivalent, they are unpaid and unpayable save in this, that:

> The firm patriot there,
> Who made the welfare of mankind his care,
> Shall know he conquer'd.
>
> ADDISON, *Cato*

In this connexion it is impossible to exaggerate the dangers that will confront us if we depart from or become lax in our interpretation of the fundamental principle upon which Naval or Military pensions are granted.

For it is beyond doubt that the corruption which marred the administration of the United States pension scheme in large part followed the failure or omission on the part of Congress to resist the growing tendency to extend the privileges of pension to discharged soldiers who, under the original regulations, were ineligible.

The same danger will beset us in this country when in future years the soldier, now young, has become old, and haply disabled —but *not from causes attributable to military service.* It is then that we shall find how difficult it is to adhere strictly to our definition of what constitutes eligibility for pension. This in no distant future too, we may add, as older and older men are being drawn into the maelstrom of war!

*Military Pensions not to be confounded with Old Age Pensions*

"What Reason weaves by Passion is undone," a saying those responsible for pension legislation would do well to bear in mind. In a recent editorial in the *Times* the fear was expressed that "Public gratitude may be exploited for party ends, and if a beginning is once made, pensions may become the soiled battle-ground of rival factions contending for public support by out-bidding each other in the liberality of their gifts to war heroes."

The said "liberality" will probably take the form of a crystallized effort to *extend the benefits of pension beyond the point contemplated by the Royal Warrant or provided for by the administrative machinery.*

That pensions may become the sport of political intrigue is, as the writer above referred to remarks, "a real and ominous contingency, and it becomes more considerable with every month that war lasts. We should like to see Parliament set up a properly constituted Standing Committee to which all pension questions could be referred."

But it is to be hoped that in so doing Parliament will at the same time clearly define its powers, and not, as was said of the American Congress, practically relinquish all control of pension legislation.

Thus the Grand Army of the Republic, through the medium of its Pension Committee, rapidly became supreme arbiter in all matters relating to pension. "That Pension Committee," observed an American writer recently, "is the House of Representatives, the Senate, and the President combined, so far as pension legislation is concerned. It publicly boasts that it has written all the pension laws of the last forty years. It takes counsel with itself, formulates its programme, and presents its 'demands' to Congress. 'Go to Congress and present your demands: and not with bowed heads,' said Commander Russell A. Alger many years ago. Congress almost invariably obeys its orders."

The power at the back of the Grand Army Pension Committee was, of course, the consolidated "soldier vote." To excite the hostility of this organized phalanx was tantamount to political suicide, and "increased pensions" became the slogan of would-be members of Congress. All for the "soldier" and none for the "State" would appear to have been their watchword, and it is instructive to trace the successive stages of their political campaign.

Up to 1890 Congress had insisted that no discharged soldier should receive a pension save on account of infirmities or dis-

abilities *attributable to military service.* The rigidity of this rule was resented by the political friends of the "old soldier," who moved Heaven and earth to secure the passage of private Bills, under which soldiers and their dependents, disqualified under the existing laws, became eligible for pensions. For "Ingenious as the medical or legal mind proved in discovering disabilities and immediately connecting them with the field of battle, there were still many thousands of cases that baffled their most skilful efforts. The veterans were getting old; traces of age were becoming manifest; all kinds of complaints were enfeebling them. These men were invalids in varying degrees, but they were not war invalids; their troubles were merely ordinary physical decay. They could not qualify for military pensions under the laws of any country. They were constantly attempting to get upon the rolls, but liberal as our system was it did not include them."

Placed in this *impasse* the Pension Committee of the Grand Army of the Republic determined that the laws must be so altered as to secure the inclusion under the pension system of all disabled soldiers, *indifferently whether their disabilities were attributable to military service or not.* Accordingly, by the law of 1890 all soldiers incapable of manual labour, and this from causes not referable to vice or misconduct, automatically became pensioners. In three years the number of discharged soldiers on the Pension Roll rose from 489,000 to 996,000, and the expenditure of pensions from $86,000,000 up to $157,000,000.

It so happened then that up to 1907 pensions were limited to (1) *soldiers disabled through military service*; (2) *those disabled, not through military service, but from any other cause.* Surely now, it might be thought, the most ardent friend of the "old soldier" would feel satisfied that the great Republic had placed itself beyond the pale of any reasonable reproach on the score of indifference to the claims of the disabled hero. But unfortunately the habit of asking for assistance grows by indulgence, *l'appétit vient en mangeant.* The success of some excites the avarice of others.

Up to 1907 the Civil War veteran who "could show a slight heart murmur, a suspicion of rheumatism, a touch of nervousness, a mild disarrangement of the digestive system, an infinitesimal dimness in sight and hearing, a little 'crepitation of the shoulders,' a 'furry tongue,' or a 'tenderness over the stomach' had established a legal claim upon the nation's bounty."

But what of the discharged soldier who was *merely old and not disabled*? How sad was his case! For disabled neither through military service nor otherwise he, "a saviour of his

country," stood without the pale. The ingenuity of the soldier friend would not be baulked, and with the passage of the Sherwood Pension Bill in 1912 any survivor of the Civil War—if he had attained the age of sixty-two years, had served at least ninety days, and had obtained an honourable discharge—forthwith received a pension.

What pitfalls therefore await us as a nation if we begin to tamper with the basal principle that governs or should govern the awarding of naval or military pensions. *Facilis descensus Averni.* The United States at first restricted its pensions to those disabled in or through military service. But little by little it fell from grace, and its Nemesis was that "forty-six years after the echoes of the last gun fired in the Civil War died away it was officially estimated that rather more than 550,000 of those who served therein in any military capacity still survived, and that 96 per cent. of those surviving were the recipients of pensions!"

We have dealt at this length with the pension abuses that may ensue through political intrigue, for all is of naught if our statesmen do not resolutely face these by no means remote contingencies, their policy animated, not by the fear of numbers, the blind worship of majorities, but by that true patriotism which will not brook the sapping of a great nation's *morale*, the sacrifice of national virility to political expediency.

## The Call for Discrimination

The days of ease and prosperity have for the time departed, and we stand at the threshold of a new—a stern age. The nations, chafing at the restraints of war, wait but the moment to again join issue in fierce economic combat. Shadowed even now by the impending struggle, we must beware lest the fruits of victory be sacrificed to sloth or discord. To be forewarned is to be forearmed, and our buckler in the coming strife must be *national efficiency*, and aught that threatens its production and maintenance must be ruthlessly cast aside in the cause of honour and civilization. Reflections such as these are not irrelevant—nay, wholly pertinent to the question of pensions and their administration.

For with the diffusion of humanitarian sentiment we run the risk that our solicitude—wholly praiseworthy—for the disabled soldier may be exploited to the detriment of the common weal. Alive to this by no means remote contingency, all who have studied the problem of pension administration agree as to the necessity of discrimination and differential treatment. It is

essential that we distinguish between those who are and those who are not worthy of the nation's bounty.

We must not allow our sympathy with the deserving to shelter the undeserving and so create embarrassment. Nor does such clear-sightedness entail any injustice to the disabled soldier—nay, the reverse.

For clearly, indiscriminate awarding of pensions, regardless of merit, does but restrict the funds available for those whom it is alike our privilege and our delight to succour.

Moreover, there are *moral* considerations that must not be lost sight of. Profuse and promiscuous granting of pensions will inevitably bring its curse. It saps the sense of self-respect incidental to self-support, and if unrestrained undermines the *morale* of the community.

Self-reliance is, we pride ourselves, a characteristic British quality, one, moreover, to be fostered rather than to be discouraged, as it inevitably will be if pensions are recklessly distributed. We must recollect that even disabled soldiers have some faults and some duties. We must, therefore, learn to recognize the work-shy, lest we mistake *indolence* for patience, and *lazy indifference* for fortitude.

> My next desire is, void of care and strife,
> To lead a soft, secure, inglorious life.
>
> DRYDEN

Indolence, whether of body or mind, is a vice to be guarded against, and the crippled or maimed individual is but too apt to sink into a state of moral torpor—averse to anything that savours of exertion, whether of head or hand. Sympathy with such persons must not blind us to their deficiencies. If they are capable of work it is their duty to work. To encourage them to become a total burden on the community is to do the State and themselves an injustice.

Again, the disabled or mutilated individual, deeming himself ill-used by Fate, not seldom develops a morbid mentality. In such event he may seek by cunning or fraud to make capital of his disability, recalling to mind somewhat the attitude of the misshapen Richard III :

> Since the Heavens have shap'd my body so,
> Let hell make crook'd my mind to answer it.
>
> 3 *Henry VI*, v, 6

Many, too, their *morale* sapped by their misfortunes, will, to excite pity and commiseration, deliberately exaggerate the degree of their infirmity, and both the State and the public must beware

lest their generosity be imposed upon, and they themselves become the unwitting agents of social corruption.

> Let not the fervent tongue,
> Prompt to deceive, with adulation smooth
> Gain on your purpos'd will.
>
> THOMSON

Such reflections on the seamy side of human nature, though repugnant to our self-esteem, are yet wholly germane to our subject. For it is well known that after the Napoleonic Wars the systems of bounty, half-pay, and pension so stimulated the instincts of cupidity that the prevalence of feigned and factitious diseases was such as to constitute a public scandal.

As Johnson once observed: "There is not, perhaps, in all the stores of ideal anguish a thought more painful than the consciousness of having propagated corruption." Accordingly, if we are determined, as we are, to suffer no niggardliness toward the disabled soldier, let us be equally determined that none other than those rightly entitled shall be enrolled in the noble Army of Pensioners. But the machinery for this essential discrimination must be adequate. For discrimination is the outcome of deliberation, and "hustling" is here out of place. Otherwise it becomes a farce, the malingerer and the shirker find in it their happy hunting-ground, and the system breaks down. The laxity becomes known, and as the habit of asking for assistance grows by indulgence, the number of applicants increases, and ultimately demoralization overtakes, not only the recipients, but also the administrators.

We see, therefore, that the moral responsibilities of those charged with the dispensation of pensions are indeed onerous. It lies with them to cultivate or not the sense of duty, of self-restraint, steady effort, and the maintenance of a high ideal. Happily for them they have to hand a strong ally in the massive pressure that will be exerted by the impending economic struggle 'twixt the nations—"the survival of the fittest." This of itself will tend largely to curb any latent tendency to live according to the Gospel of Ease. Who shall doubt, too, that, drawn through the furnace of affliction, this great nation emerges other than it was?—

> stands renewed,
> Sheds its own piddling aims,
> Approves its virtue, puts behind itself
> The comfortable dream and goes,
> Armoured and militant
> New-pithed, new-souled, new-visioned, up the steeps
> To those great altitudes, whereat the weak

Live not. But only the strong
Have leave to strive and suffer and achieve.
W. E. Henley

## The Need of Discipline

No Act that was ever fashioned but had its moral excellencies and no less its moral deficiencies, and the same is true of a Pension Warrant. But in extenuation of any defects it must be frankly admitted that the task of framing such an instrument is anything but easy.

To hold the balance true 'twixt the State and the individual—the soldier—demands no small measure of finesse. Both have rights to maintain, and both alike obligations to fulfil. Moreover, these moral imperatives being conceded, the bond needs further to be cemented by mutual faith and goodwill.

Solicitude for the welfare of those who have sacrificed themselves for the common weal is one of the traits which differentiate civilization from barbarism. But for the stability of the State it is essential that our pension system be not extended beyond its true limits, its benefits transmuted into political largesse—dispensed by bureaucrats to further their private ambitions.

" To have suffered for the country is a badge of honour ; the veteran is a man to honour and the pension roll must be a roll of honour."

Be a " Roll of Honour "—that is the point. But how are we to attain this ideal ? Only by strictly adhering to the fundamental qualification that a pensioner shall be " one who is in receipt of a pension or stated allowance on account of injuries received in service." Even then there will be ample room for abuse—for the intrusion of dishonest claims.

For while we have dealt at length with the abuses that, through impure legislation, marred the pension system of our transatlantic brethren, let us not forget that we too have had our pension scandal ! Let him who doubts it turn to the writings of Marshall, Gavin, and others who in the last century deplored the spread of corruption amongst discharged soldiers in the years following the close of the Napoleonic Wars. Fortunately it was not, as in the United States, artificially stimulated by political adventurers, nevertheless the instincts of cupidity were so aroused that some twenty years after Napoleon's defeat *there were as many soldiers on the Pension List as on the Army Roll* ! Well might our national self-complacency feel disturbed, and the measure of the reaction may be gauged by the stringent terms of the virile Warrant of 1829—an embodied condemnation of the malingerer and all his works !

The veteran of Peninsular fame, comparing the Warrant of his day with that of 1915, might well rub his eyes ! Surely the millennium is at hand—no hint at human frailties, at avarice or deceit, and of the malingerer, as such, not a word ! How like us too, in these days, to relegate all that savours of discipline to smug obscurity—to " Provisions of previous Warrants remaining in force ! "

There seems to be growing up amongst us an unaccountable repugnance to plain speaking, a tendency to gloss over rather than to impeach human frailties. Time was when we bluntly denounced " skulking," " shirking," or " swinging the lead," but now we prefer to deplore the prevalence of a " certain disposition to make use of the sickness benefit while out of employment, or to cover a period of what no doubt may be a very desirable rest from labour." Such, in truth, was the euphemistic manner in which the Departmental Committee on Sickness Benefit Claims under the National Insurance Act referred to the malingerer. His vagaries, forsooth, pointed rather to " an overkeenness of business instinct than any attempt at dishonest practices." Why this overdelicacy of speech, this affected refinement of language ? How Carlyle's gorge would have risen at such nauseating twaddle !

How pernicious, too, is the effect of such juggling with words. In the United States it led in the end to the inclusion of even " deserters within the Pension Roll." An American critic, Charles Francis Adams, discussing this question, observed that the robust Lincoln bluntly characterized such behaviour as " rottenness," but now they " differentiate it in Congress as only a form of nostalgia ! The poor lads, fresh from their innocent homes, laboured under such an uncontrollable desire to get back to their mammas and the vine-covered cottage that they instinctively sought the enemy's lines as being the most direct road thereto. They were, however, all good boys, though a bit guileless perhaps, but all ' heroes ' now, every one, without discrimination, is to have for life a dollar a day pension money ! "

### *The Call for Specific Mention of Malingering as a Cause for Forfeiture or Reduction of Pension*

It is interesting to note that such grounds for forfeiture as still remain in force were in the main laid down in the Warrant of '29. They, of course, relate to a period when the administration of pensions was still wholly vested in the War Office or their authorized representatives—the Chelsea Commissioners.

Now, as a reference to the foot-note clearly shows, the offences entailing forfeiture were in large part only such as were likely

to arise in the case of discharged soldiers eligible for or in receipt of *long-service pensions.**

Manifestly all those fraudulent practices enumerated in clause (*a*) are applicable only to the professional as opposed to the citizen soldier. Moreover, one cannot help remarking that those offences, felonious or other, envisaged in clauses (*b*), (*c*), (*d*), (*e*), and (*f*) are of a nature such as may be hoped will be of rare incidence.

In short, we cannot escape the conviction that generally speaking the deterrent and disciplinary effect of the clauses relating to forfeiture of pensions is largely discounted by their inappositeness to the present-day citizen soldier. He, be it remembered, has a right to pension only on the plea of *disablement attributable to or aggravated by military service.* Consequently such fraudulent practices as he may be guilty of will relate to his said disability. His claim to a pension resting solely on the *genuineness* of his disability, it is obvious that, *ipso facto*, any *fraud in connexion therewith* would constitute an adequate reason for *reduction* or *withdrawal* of his pension.

Now, in the Warrant of '29 there were included certain articles proclaiming that any *soldier guilty of malingering might forfeit his claim* to pension, but these same no longer find a place in subsequent Warrants. Why this timorousness, this unwillingness to face facts ?

We have to deal with human nature as it is, not as we should

* "1208. A pensioner shall be subject to forfeiture of pension under the following circumstances :

"(*a*) For wilfully obtaining credit for more than his actual service by means of false entries, alterations, or erasures in regimental books, documents, or parchment certificates, or by any misrepresentation of his real claims.

"(*b*) For the commission of any felonious act, gross fraud, or gross misconduct proved to the satisfaction of Our Commissioners of Chelsea Hospital, including in the case of men enlisted after the 31st December, 1884, any such offence which may have been committed before discharge from Our Army and for which the offender has not been already punished by the military authorities.

"(*c*) For not appearing, if under the age of 55 in the case of a warrant officer, or if under the age of 50 in the case of other pensioners, when called upon by lawful authority, according to the regulations and conditions of the service, to serve in a regiment of the line or other corps within the limits of the United Kingdom, or when called upon by the governor of the colony in which the pensioner resides ; or for refusing so to serve when required.

"(*d*) For neglecting to obey the call of the magistrates, or other sufficient authority, to assist in preserving the public peace.

"(*e*) For gross violence or outrage towards any person engaged at the time on the duty of paying the pensioners.

"(*f*) For assuming a false name when committed or imprisoned by the magistrates on any charge of vagrancy, or of any misdemeanour, or crime.—Royal Warrant for the Pay, etc., of the Army, 1914.

like it to be. Or do we flatter ourselves that we are superior to our forbears through whose heroism and self-sacrifice we entered into our heritage ? So much so that we would deem ourselves immune from that particular form of corruption—*malingering*—that wellnigh undermined the stability of the pension scheme of their day. This, too, in the light of our experience under the National Insurance Scheme and the Compensation Laws !

But it may be retorted that though the term malingering is not specifically mentioned in the Warrants of 1917 or 1918, still the discretionary powers of the pension authorities as such enable them to deal with these fraudulent practices. It may be held that the crime malingering would justify withdrawal of pension on the ground that the alleged disability was due " to the serious negligence or misconduct of the discharged man." (Pension Warrant, 1917, article 1, clause 1.) *

Nevertheless, it is, we think, to be deplored that the authorities have not seen fit to *mention specifically* the one particular form of fraud which by common consent is, and will probably continue to be, the most common type of imposition resorted to by pensioners, actual or potential.

Moreover, we are reminded, too, of the controversy that raged around the " vice or misconduct " formula which found a place in Windham's Act relating to the granting of pensions (1806). A similar difficulty in deciding what exactly was envisaged within the phrase " vice or misconduct " might well arise in regard of the formula " serious negligence or misconduct." (*Vide* chap. i, p. 11.)

Indeed, when we have regard to certain additional clauses incorporated in the Warrant of 1918, one is tempted to conclude that the authorities have already felt the necessity of enlarging and defining more exactly their powers of dealing with this particular class of offence.

Thus in the Warrant of 1918 it is laid down that " The Minister of Pensions may at any time order the review of any pension in any case where he has reason to believe that a pension has been obtained by any *improper means*." (Art. 5, clause 2 (*b*).) Doubtless under this clause it would be quite within the Minister's power to reduce or withdraw any pension in the case of a malingerer. But why this indefiniteness, this mealy-mouthed phraseology ? One turns with relief to Article 25 of the Pension Warrant of 1829, its refreshing candour, its avowed recognition of malinger-

* We refer to those types of malingering in which automutilation has been practised or some disorder voluntarily produced, or the same when existing intentionally aggravated by artificial means.

ing, and its uncompromising resolution to deal summarily with such offenders.

"*Any soldier convicted before a competent court martial of feigning or producing disease or infirmity, or of materially injuring his health by habitual drunkenness, or of being detained in hospital by any disease contracted by his own vice or intemperance, thereby rendering himself unfit for service; or of absenting himself from an hospital whilst under medical treatment, or of being guilty of a gross violation of the rules of the hospital, or of intentionally protracting his cure; or of wilfully aggravating his disease; shall be liable to be brought to trial by the regimental commanding officer, or on charges preferred by the surgeon of the hospital, and to have the whole time of such detention in hospital deducted from his service, or of forfeiting all claim to pension, provided such forfeiture form part of the sentence of the court martial by which he was convicted.*" —Royal Warrant 1829, clause 25.

We could wish that in future Warrants this article, in substance, might be included, for it practically envisages every type of simulation that may be resorted to. Pension Warrants, be it noted, are easy of access, and doubtless the majority of soldiers will at one time or another be tempted to scan their contents. In view of possible misapprehension through ignorance, would it not be well that this particular type of imposition, most likely of committal, should be explicitly mentioned in terms to be understood of the people, and not hidden beneath smug phrases?

In conclusion, we would urge the more frank admission in future Warrants of the necessity for disciplinary measures, not only because, as Fluellen wisely observed, "Disciplines ought to be used," but more so that the true intent of discipline is not, as is so frequently misapprehended, punitive, but *educative*. Let us, therefore, take time by the forelock, lest in this as in other spheres of action the ominous words "Too late!" may find an echo.

> Call for some men of sound direction,
> Let's lack no discipline; make no delay.
>
> *Richard III*, v, 3.

## CHAPTER V

## DISCUSSION OF CERTAIN ARTICLES—TEMPORARY AND PERMANENT PENSIONS

### Evolution of the Royal Warrants

" A VAST portion of the business of the Courts of Common Law," observed Lord Brougham, " consists in endeavouring to construe clauses which are obscure or inconsistent with clauses of other Acts or parts of the same Act that are inconsistent with each other." Study of the various Warrants and comparison of their component articles might well lead one, if satirically inclined, to the same cynical conclusions. But criticism is disarmed by the avowedly tentative character of the Royal Warrants, and no less by the kindly solicitude for the disabled soldier which permeates every provision.

We do not purpose in this chapter discussing all the various articles contained in recent Warrants, but shall confine our study to certain clauses—their aptness or not for achieving the end desired, and the serial modifications that have ensued in their tenor—under the influence of ever-expanding experience. We shall, moreover, restrict our purview still further, limiting our animadversions to only two Warrants—viz. those of 1917 and the following year.

### The Temporary Pensions

Thus in article 5, clause 1, of the Royal Warrant of 1917, it was laid down that " *In the case of a man whose disablement has not reached its final condition, a pension may be temporarily granted at the rate appropriate to his temporary disablement, and the grant shall be reviewed from time to time until the permanent assessment can be made.*"

The rendering of this clause is, we would submit, somewhat involved if not actually inconsistent with itself. It proceeds on the unjustifiable presumption that the condition under review involves only *temporary* disablement, whereas its closing words obviously envisage the possibility of the same being in greater or lesser degree *permanent* in duration. We would venture to

suggest that the manifest intent of the clause would be clarified if for the word "temporary" were substituted "existing"—viz. "appropriate to his *existing* disablement."

Again, in regard of the phrase "has not reached its final condition," it appears to us that the adjective "final" is, as here employed, somewhat unhappy. While we fully agree that premature fixation of a pension as *permanent* is undesirable, still it is clear that it is not the fact that "it has reached its final condition" that renders a disablement fit for permanent pension, but its *stability*. We would suggest as being more appropriate that for "final" be substituted the adjective "stable" viz.—"has not reached a *stable* condition."

In the Royal Warrant of 1918 * the clause relating to *temporary disablement pensions* has undergone slight modification, but the changes introduced in no way invalidate the above criticisms, which we venture to think are still applicable.

With this reservation its terms are pre-eminently just, both to the State and the soldier, as also to the medical man. If strictly adhered to, it provides that the State will not be imposed upon, the soldier given his just due, and the medical expert allowed the necessary time for the formation of a sound and well-matured opinion.

In other words, its provisions are such as permit of a soldier's pension being reviewed from time to time, and increased, diminished, or abolished according as to whether his disability has undergone aggravation, has improved, or haply disappeared. Lastly, in the event of the disability being in some measure permanent, it provides that not until it has "reached its final condition" shall the medical man be called upon to assess the measure of his permanent or residual disablement.

On the other hand, thoughtful students of the Warrants have been greatly exercised as to the conditions attaching to a *permanent* pension, and to a consideration of these we now revert. In pursuance of this end it will, we think, be advisable to deal *seriatim* with the prerequisites, the stipulations governing permanent awards as laid down in the Warrants of 1917 and 1918.

* "(2) Except in those cases where the disablement has reached its final condition a disablement pension shall be temporary, at the rate appropriate to the temporary disablement, and the grant shall be reviewed from time to time until a permanent assessment can be made or the grant ceases. Where a temporary disablement pension, including renewals, does not run beyond one year a supplementary gratuity of £5 may be granted at the termination of such pension."—Royal Warrant, May 1918.

## The Permanent Pension

The word permanent, *qua* its usage as such in the Royal Warrants, suffers violence—viz. is divorced from its true meaning. It seems, therefore, necessary to insist that the term *permanent* signifies "immutable," "unchanging," as opposed to "temporary." As currently understood, a permanent pension is a regular or periodic payment made by the Government in consideration of disabilities or infirmities attributable to or aggravated by military service. It is generally accepted as being *unalterable*—immune from change, intermission, or cessation—provided the recipient gives no occasion for forfeiture. Given the foregoing characters, the term *permanent* is applicable to the award.

But by the terms of the Royal Warrant the so-called permanent pension admits of *increase*, and indeed, according to that of 1918, of *decrease*. It can be increased "if there be a substantial increase in the extent of the disablement due to the original cause." It can be decreased if the pension granted to the soldier prove to be "in excess of the amount appropriate to the degree of his disablement."

Open to these fluctuations the permanent pension borrows, so to speak, the salient feature of a *temporary* allowance—its mutability or liability to alteration. In this way the characters of the temporary and permanent pensions lose their clear-cut distinctions and become blurred—a consummation, as we think, not desirable.

The need of a new qualifying term, a substitute for the adjective "permanent," seems indicated, if we are to escape the paradox of a *permanent pension subject to change*. How different the attitude of Continental authorities! Logical and consistent, it contrasts with that of our own powers, which is illogical and inconsistent: *hinc illæ lachrymæ*!

In all countries save our own a *permanent* pension, once granted, is *unalterable*—viz. can undergo *neither increase nor decrease*. This because it is assumed that its fixation as *permanent* will not be undertaken until the disability or infirmity has, to use the words of our own Warrants, "reached its final condition." Otherwise expressed, a pension is held ineligible for fixation as permanent pending the fulfilment of the following conditions: The disability or infirmity must be incurable—of a certain severity. It must have arrived at a *stable* condition—at a state of equilibrium. This postulates that not only have the normal processes of recovery been given ample time for maturing, but also that the resources of therapy have been exhausted.

The foregoing definition of the requirements that must be fulfilled before a disability is held ripe for final assessment fully

justify Continental authorities in holding that they have dealt fairly as between the State and the discharged soldier. It may be objected that the immutability of a permanent pension involves hardship to the pensioner if his disability subsequently undergo aggravation. But it may be retorted that if in that event he be denied an *increase*, he is, on the other hand, liable to *no reduction if the extent of his disablement diminish*, no matter to what degree.

We have to recall, too, that disabilities on the whole, through the marvellous powers of *functional adaptation* inherent in the human frame, tend with the passing years, not to increase, but rather to *decrease*. This beneficent biological tendency—a friendly ally working always in the interests of the individual—tends largely to redress any injustice that may accrue through the immutability of the permanent pension. (*Vide* chapter on "Adaptation.")

So much for the arguments that may be adduced in favour of retaining the essential attribute of the permanent pension—its *fixity* and, as generally accepted, immunity from alteration. What, then, may we ask, are the motives that have occasioned departure therefrom ?

Now given that a permanent pension has been rightly granted there is no reason for alteration thereof. It is therefore tantamount to an admission of error, of maladministration, if a pension, after fixation as permanent, call for *alteration*. In other words, it implies that the recipient, if not wrongly, has at any rate been *prematurely* awarded a *permanent* pension. For it is obvious that any disability which admits of "a substantial increase due to the original cause" has *not* "reached its final condition." Similarly, if the pension awarded prove to be "in excess of the amount appropriate to the degree of his disablement," it shows that either the disability had not "reached its final condition," or that "by error in interpretation or fact" the assessment of the degree of disablement was excessive, and, failing this, that the pension was "granted by error" or "obtained by improper means."

To sum up, it will be seen that the system of permanent awards, if injustice or abuse is to be obviated, calls for a high degree of administrative efficiency. The need thereof, indeed, is but too plainly reflected in the modifications from time to time introduced in regard to their dispensation and conditions of tenure.

Such general considerations as the foregoing may well form a prelude to the further task of tracing out in serial fashion the successive changes necessitated in our attitude towards

permanent awards, and this as exemplified in the Warrants of 1917 and 1918.

## Provisions relating to Permanent Pensions in the Warrant of 1917

"(2) *When a permanent pension has been granted it shall not be altered on account of any change in the man's earning capacity, whether resulting from training or other cause; neither shall it be subject to review except:*

"(a) *When a man whose pension is assessed under article* 1 *of this Our Warrant claims that there has been a substantial increase in the extent of the disablement due to the original cause.*

"(b) *When a man whose pension is assessed under articles* 1 *and* 2 *of this Our Warrant shows that it would be more advantageous to him to be assessed under article* 3.—Royal Warrant, May 1918.

"Is not compromise of old a god among you?" * is the reflection that study of the above article provokes. For assuredly compromise is here writ large. Anxious to retain intact the traditional inviolacy attaching to a permanent pension, they have nevertheless ventured upon innovation. But the compromise involved being but half-hearted, or rather one-sided, failed to achieve the success that a compact by mutual concessions would have assured.

We allude, of course, to sub-clause (*a*), which provides that if "the extent of the disablement shall show a substantial increase due to the original cause" the amount of the pension shall be correspondingly increased. But in this as in all other articles of the Royal Warrant there are two interested parties—the *State* and the *disabled soldier*, and to hold the balance true 'twixt the twain is the ideal aim.

That the soldier, if his disablement undergo aggravation, should have his pension augmented, is but right and fair. But what if the reverse occur and his disablement *decrease*? Here the Warrant is silent, though obviously, in common equity, there should have been a balancing clause to the effect that *given decrease of disablement a corresponding diminution in pension* should ensue.

Apart from the fact that the claims of the State are overlooked, the provisions of sub-clause (*a*) do but accentuate the differential treatment accorded soldiers on *temporary* allowance as opposed to those in enjoyment of a *permanent* pension. It will, therefore, we think, be instructive to bring into contrast the conditions of tenure in either instance *as obtaining in the Warrant of* 1917.

* Swinburne.

### *Comparison of Conditions of Tenure of Temporary and Permanent Pensions*

A soldier on *temporary* allowance holds his pension, as it were, " by favour "—viz. is liable to *compulsory* review.

His claim is judged *ex debito justitiæ*, i.e. is subject to the same conditions that would obtain if, in civil life, he were in receipt of a compensation allowance for an " industrial accident."

A pensioner on *permanent* pension holds his pension " by right "—is not subject to compulsory review, but *only at his own request.* Furthermore, if he demand revisional examination his position is still a privileged one. His claim is judged from an eclectic, an *ex parte*, standpoint. In other words, his pension is envisaged only from the point of view of *increase*, never of reduction. At any rate, whatever the discretionary powers vested in the authorities, it was not in the Warrant under consideration (1917) laid down that the soldier on permanent pension, if the extent of his disablement *decreased*, was liable to reduction or withdrawal of his pension.

The omission to take cognizance of this possibility is somewhat remarkable. The more so, in that the reverse contingency—viz. *increase* of a disablement—was adequately provided for by the provisions of sub-clause (*a*), obviously introduced to redress any possible injustice referable to faulty administration of the correlated clause (article 5, clause 1).

We see, therefore, that under the Warrant of 1917 the man on permanent pension—given no appeal on his part for review—was secure from any liability to reduction of the same, no matter to what extent his disability might have undergone diminution.

The intent of sub-clause (*a*) was to redress possible injustice to the disabled soldier, and with that we have no quarrel. But its introduction also unfortunately entailed blurring of the basic distinction between a temporary and a permanent pension. The latter ceased to be *immutable.* It became liable to increase, but not to *decrease.* Had it been rendered liable to both, the demands of equity and justice as between the State and the soldier would have been fulfilled. The penalty exacted is sufficiently grave, and, broadly speaking, portends the following unwished-for eventualities:

### *Promotion of Discontent*

Prophecies are notoriously uncertain, and those relating to the future evolution of disabilities or infirmities enjoy no immunity from this failing. The frailties of the medical expert in this sphere will doubtless be reflected in the number of soldiers who

seek, and will seek, increase of their allowance under sub-clause (*a*). The legislator will, of course, salve his conscience by throwing the blame on the medical expert, although, in truth, he might with greater justice arraign himself, not for having introduced the clause, but for his omission to insert a compensatory provision whereby the equipoise, as between the State and the individual, might have been maintained.

But recriminations aside, the soldier, though he may never have heard of sub-clause (*a*), will be quick to note discrepancies in the treatment accorded to those on *temporary* as opposed to *permanent* pensions. He has a great sense of his rights and is equally alive to the obligations incumbent on the authorities.

He has himself perhaps been severely wounded, and yet has happily recovered his full powers. Naturally, and rightly too, he is interested in all matters relating to pensions, and we can fancy his attention, as it were, arrested by the following disparity in treatment, which, small blame to him, he finds hard to reconcile: "Here is this discharged comrade on a *permanent* pension improving every day and able to earn as much as, if not more than, I am, and yet he suffers no reduction in his pension." At the same time he bethinks him of yet another on *permanent* pension who has had his allowance increased. A fair-minded man, he sees no objection to the latter having his increase, for he is obviously getting worse. But what greatly exercises him is that the former pensioner, despite his recovery, has suffered no *decrease*.

Now, he is not going to worry himself as to the academic distinctions drawn between *temporary* and *permanent* pensions. He brushes these aside as irrelevant, and asks for a plain answer to a plain question. "Is it fair?" says he to himself. "I sustained a worse wound than this man on permanent pension, but I was lucky enough to get better, and my pension was reduced, and subsequently withdrawn. What is sauce for the goose is sauce for the gander. Why don't they treat all alike? If a man gets his pension fixed as *permanent* when he ought not, then why not put him back again on *temporary* allowance until you know what he really ought to have?" Be it not forgotten too, that the citizen soldier of to-day is the State, the people, the taxpayer, who will resent being victimized alike for the follies of the legislator or the mistakes of the medical profession. To avoid being made the scapegoat, the medical expert must refuse to be hustled into premature pronouncements. But to show how easily and with what good reason discontent may arise, let us take some concrete examples.

Two soldiers may sustain war injuries in the region of the

shoulder. In sequence thereto, as frequently happens, some degree of ankylosis in the neighbouring *joint* ensues. Now it is a matter of common knowledge that under such circumstances a condition simulating true ankylosis only too readily develops.

What now if in the case of one of these soldiers a diagnosis of *true ankylosis is wrongly arrived at* and he be on this basis accorded a *permanent* pension. If then subsequently he regains in large part the motility—the usefulness—of his joint, he nevertheless retains his pension and moreover *unreduced.*

His comrade is perhaps less fortunate in one sense. His shoulder joint was also at first more or less immobilized. But a man of resolution, he as soon as possible endeavours to use the arm, and through pluck and perseverance achieves his end—recovery of mobility. Moreover, no mistaken diagnosis having been made in his instance, his pension was not made *permanent,* and he remained on a *temporary* allowance.

If now when he comes up for final assessment he has wholly regained the use of his arm, he may receive *no pension.* Even if his disability in some slight measure be deemed permanent he may only receive a *gratuity.* Is he therefore not justified in feeling some resentment if he meet with the aforementioned type of case ?

To take another instance : two soldiers, in sequel to a casualty of war, developed *traumatic cataract* in both eyes. One victim undergoes a successful operation—the other refuses surgical intervention. The former happily largely regains his vision, and his pension is correspondingly graded. The latter gains a permanent pension, but subsequently to its fixation as such undergoes the operation he previously refused to submit to. Contrast their conditions if in after-life these two veterans come together ! It is quite possible that both have equally good vision, or indeed that of the twain the man who refused operation has the better sight. But lo, the one has a small—or haply only a gratuity—the other a large pension !

### *Provocation of Fraud*

Whatever our national virtues, and we believe them many, that of long-sightedness or of even a moderate measure of foresight is not, we fear, to be reckoned among them. This lack of *prevision* is writ large in the terms of sub-clause (*a*)—gravid with temptation, so stimulant of the instincts of cupidity ! The official mind would appear to be, not only unalive, but indifferent to the evil potentialities of *suggestion* in promoting what Carlyle so

deplored—" an unhealthy state of self-sentience, self-survey," which, he rightly adds, is " the precursor and prognostic of still worse health."

That the *increase* must be " substantial " and " due to the original cause " shows clearly that the authorities were not wholly blind to the contingencies resident in sub-clause (*a*). But how difficult will it be often in years hence to determine where a given disability ends and the infirmities of age begin ! In the absence of any *time limit*, who can deny that our professional limitations will be in danger of exploitation.

Our forefathers had no mind to be victimized in this fashion, for although they too recognized that sheer justice might demand the increase of a pension, still they stipulated that the appeal for review on the plea of aggravation had to be presented *within a specified time after discharge.*

Thus article 14 of the Pension Warrant of 1829 runs as follows :

" *The decision of the Commissioners in fixing the rate of pension granted for service wounds, or disabilities, shall be* final, *and the amount of the pension shall not be augmented on account of alleged increase of disability, after the soldier shall have left the service, unless any* special *circumstances shall occur and be brought forward within two years after the original grant of pension, to justify a reconsideration thereof.*"

In the absence of any time limit some safeguard seems indicated—some qualifying clause that shall act as a deterrent. Meanwhile we would suggest that our attitude towards a pensioner seeking increase of his allowance under sub-clause (*a*) should be governed by the following considerations :

If a pensioner, on the plea of *aggravation*, come up for review, let it be an impartial review. Cast his case, as it were, anew into the melting-pot, place him back on a *temporary* allowance until such time as it shall be established whether such be genuine or spurious—and if the latter, whether conscious and fraudulent or unconscious and non-fraudulent.

If aggravation due to the original cause is established, an increase of pension, under sub-clause (*a*), is clearly indicated. If it transpire that the aggravation be spurious, but *unconscious* and *non-fraudulent*, let the pension remain *in statu quo*. But if it be proved to be *conscious* and *fraudulent*, reduce or withdraw the pension. If such were the recognized method of dealing with cases of alleged aggravation it would assuredly act as a deterrent against fraudulent claims. Its adoption involves no hardness of disposition, no want of sympathy with the disabled soldier. It falls hardly on the *malingerer* only.

But turn to another aspect of the question, this sub-clause (*a*) increases immeasurably the responsibility thrust upon the medical expert.

Aggravation—how often it spells *exaggeration*, which either conscious or unconscious is the most common form of *malingering*! Also, unfortunately, it is the most difficult of all types of simulation to detect.

Presumably all pensioners that come up for increase of their pension under sub-clause (*a*) will be the subjects of *organic* or *static* disabilities or infirmities. How intricate, then, becomes the problem that the medical expert is called upon to solve! For that type of fraud in which some measure of disability or infirmity actually exists, but which is exaggerated by pretension or simulation, is infinitely more difficult of detection than when the disability or infirmity is *wholly pretended or simulated.* For unhappily in this instance—truth and fraud being intimately entangled—to estimate how much of the disability is real and how much feigned is not an easy task. Of this difficulty unscrupulous persons are fully aware, and we see therefore how insidiously the *morale* of the less virile types of pensioner may become undermined. In short, sub-clause (*a*) is undoubtedly a bait held out to cupidity. Moreover, the chances of successful imposition thereunder are much enhanced by the limitations that beset the profession in the matter of detecting this particular form of partial malingering—viz. *fraudulent exaggeration of the effects of an existing disability or infirmity.*

### *Perpetration of Injustice to the State*

In regard to a *permanent* pension it is categorically affirmed that "it shall not be altered" on account of any change in the man's *earning capacity.* No, certainly not when the indications are that, if altered, it can only in common fairness be altered in the direction of reduction—viz. *altered in the interests of the State.* This undeniably, if we may judge from the context. For while a "change" in the man's earning capacity may be in the direction of increase or decrease it is surely the former contingency that is adumbrated. The State stands to lose on all counts. Stands to be mulct alike for the mistakes of the legislator, the false prophecies of the doctor, and the exaggerations, conscious or unconscious, of the pensioner.

On the other hand, the pensioner stands to win on all counts. His pension once fixed as *permanent*—it matters not if his disablement, as judged by *increased earning capacity, diminish*—it remains *unaltered.* But if the opposite ensue—viz. that the

*extent of his disablement* has *increased*, then his pension, too, *undergoes increase.*

Note the change in the basis of adjustment. When it is a case, if any, for *reduction of pension*, the man's *earnings* come to the fore, but to the extent of his disablement, presumably much lessened, there is no reference. He is a poor pensioner from whom nothing must be withdrawn. This even though he possibly owe his increased earning capacity to the re-education or training that a grateful State has afforded him.

On the other hand, if it be a question of *increase of his pension*, the *extent of the man's disablement* is thrust forward, his earnings sink into the background, and the appeal *ad misericordiam* forthwith resorted to.

How different our treatment of the individual employer! If a workman suffer an "industrial accident" and on revisional examination it transpire that the consequent disablement, as judged by *increased earning capacity*, has diminished, his compensation allowance is *reduced.*

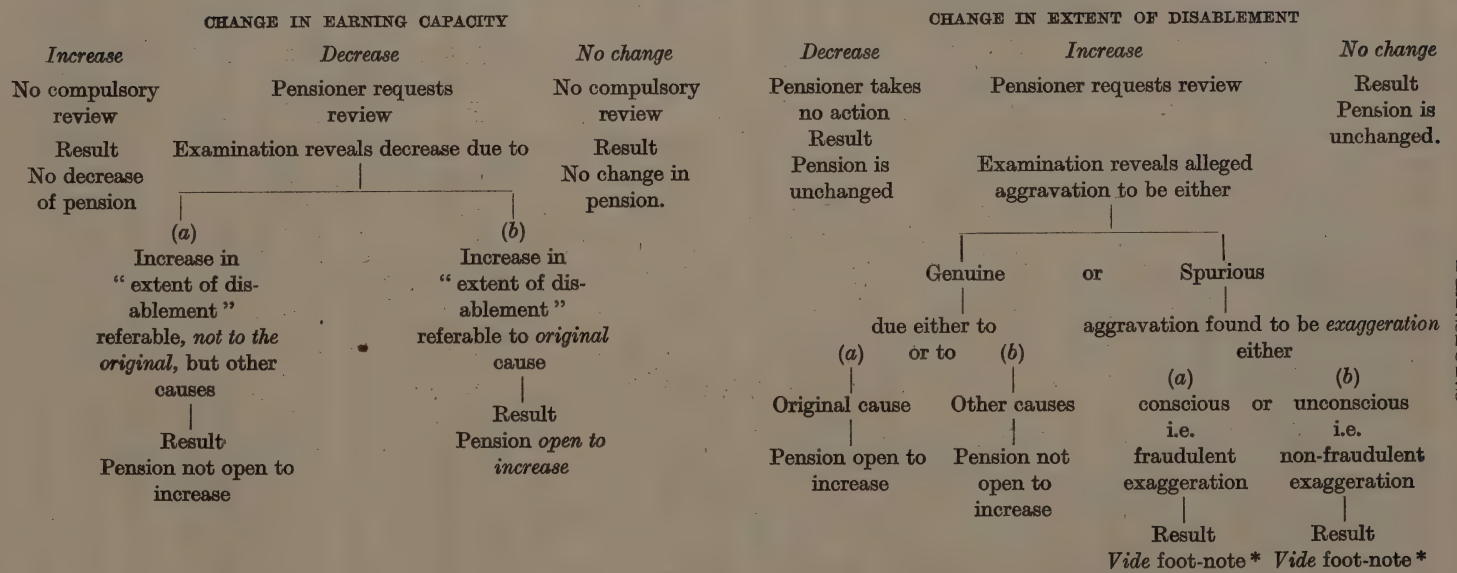
Vice versa, if it so chance that the sequential disablement, as evidenced by *diminished earning capacity*, has increased, his weekly payment is also *increased.* There is no change in the basis of adjustment—earning capacity in one instance and extent of disablement in the other.

Now while we may well sympathize with the solicitude displayed by the pension authorities for the disabled soldier or pensioner, still what of the interests of the State! We hear much these days of "Government of the people, by the people, for the people." Are the interests of the people—the taxpayer—sufficiently realized? Will not the soldier who has borne the heat and burden of the day, and happily unscathed, ponder these things? Will he not say to himself, "If you allow a permanent pension to be increased, it is only fair to allow it to be decreased. Why not compel the permanent pensioner to come up for revision after a certain number of years?" Verily, he would be justified of history in his demand for revision! For Marshall, in his well-known work, states that "of about 26,000 pensioners that were in Ireland in 1828, 6000 were upon examination found fit for service in the field or in a garrison." Moreover, he continues, "that of the pensioners in Great Britain receiving less than 1s. a day, one-third to one-half were in 1831 found fit for military duty."

Under the French system at the present day, if there be any doubt as to the eligibility of the subject for *permanent* pension, he has to submit to a biannual examination and this perhaps over a prolonged period.

## THE PENSION WARRANT OF 1917

### Table of Contingencies under Article 5, Clause (2), and Sub-clause (*a*)




* The Warrant does not state whether, given an appeal on the score of exaggeration (due to original cause), in the event of the same being *spurious* (with fraudulent intent or not), it is open to the pension authorities to decrease or withdraw the pension. The general impression is that a " permanent pension " may be increased, but may *not be decreased*. The framers of the Warrant have apparently failed to observe that they were guilty of this sin of omission, and are at one with the public in their joint delusion. Presumably if the allegation of the aggravation be *consciously fraudulent* it should spell *decrease or withdrawal of pension*. But no *change in the pension* seems indicated if the alleged aggravation is *unconscious* and *non-fraudulent*.

So much for our discussion of the provisions relating to the permanent pension—*as operative in the year* 1917—and now to consider the innovations or modifications introduced in the Warrant now in force.

## Provisions relating to Permanent Pensions in the Warrant of 1918

"5. (1) *When a permanent pension has been granted it shall not be altered on account of any change in the man's earning capacity, whether resulting from training or other cause; neither shall it be subject to review except:*

"(a) *When a man whose pension is assessed under article* 1 *of this Our Warrant claims that there has been a substantial increase in the extent of the disablement due to the original cause.*

"(b) *When a man whose pension is assessed under article* 1 *of this Our Warrant shows that it would be more advantageous to him to be assessed under article* 3, *provided that the cessation or reduction of any allowance under article* 2 *of this Our Warrant shall not be a ground for review.*

"(c) *Under the following subsection.*

"(2) *The Minister of Pensions may at any time order the review of any pension in any case where:*

"(a) *A pension has, by error in interpretation or fact, been granted to a disabled man in excess of the amount appropriate to the degree of his disablement;*

"(b) *The Minister of Pensions has reason to believe that a pension has been obtained by any improper means; or*

"(c) *A pension has been granted by error.*"

Nothing is more calculated to defeat its own end than timorous legislation, nothing more likely to evoke dissatisfaction. This, we submit, is precisely the error into which those in authority have fallen.

As before shown, they laid violent hands on the accepted definition of the permanent pension as being *unalterable*. But, half-hearted in their iconoclasm, they sanctioned an increase, but not a *decrease*, of the allowance. This partial or one-sided policy naturally provoked comment, and its amendment was obviously but a question of time.

Thus, if, given *aggravation* of a disability, *increase* of a permanent pension was indicated, surely in common fairness *amelioration* of the same called for a *decrease* in the allowance. But while the supplementary provisions embodied in article 2 with its sub-clause (*a*), in the Warrant of 1918, give point to our conten-

tion, yet we fear that their good intent may prove abortive. This in that here again the authorities display the same timorousness, the same failure to grasp the nettle.

To develop our argument, it has been authoritatively stated that pensioners have not been slow to avail themselves of the fact that, given *aggravation* of their disability, they are entitled to an *increased allowance*. We may take it, then, that pensioners, and rightly so, are, or shortly will be, fully alive to the privileges accorded them under article 1, sub-clause (*a*). If wishful to put in a claim for review on the plea of aggravation the pensioner is at liberty to do so. Should he, through ignorance or other cause, omit to lodge an appeal, it is his and not the State's fault.

In allocating to the interested party the onus of making a claim the State absolves itself from further responsibility, and in so doing has clearly shown its wish that the pensioner shall have ample opportunity of securing redress.

Having reviewed the provisions made to secure the *pensioner* from injustice we may now inquire whether similar care has been exercised to safeguard the interests of the *State*.

Obviously it is not to the advantage of pensioners that their monetary allowance be reduced, and it is not in human nature to expect that, given attenuation of their disability, they will forthwith present themselves at the Ministry of Pensions with a request that their allowance may be correspondingly lowered.

It is the State's interests that are here at stake, and it is the duty of its authorized representatives to ensure as far as possible their protection. Now the Minister of Pensions, we are told, may at any time order the review of any pension " if the allowance granted to the pensioner is *in excess of the amount appropriate to his degree of disablement*."

A momentous innovation this, which at a stroke abolishes that immunity from compulsory review that the *permanent* pensioner had previously enjoyed. Up to then, if he lodged no appeal, gave no occasion for forfeiture, he rested secure. But now his conditions of tenure approximate to those of his comrade on *temporary* pension. With this difference, that in the latter the liability to review is *inevitable, automatic*, while in the permanent pensioner it is neither, he is only liable to review *if the Minister of Pensions so ordain*.

Now while we welcome the investment of the Minister with these plenary powers, their adequate exercise postulates a high degree of administrative efficiency and vigilance in those responsible to him. This, without any reflection on the per-

sonnel, for we are preoccupied rather with another aspect of the problem.

Is the existing machinery adequate to give the Minister full scope for the exercise of his power ? The intent of the clause, we take it, is to redress injustice to the State—to secure it from imposition. To achieve this desired end it is clearly necessary that the Ministerial powers be enlisted in a *uniform* and *impartial* manner.

How, may we ask, can this be attained save through the medium of a *compulsory review of all discharged soldiers on permanent pension* ?

As matters stand, it is clear that a man on *permanent* pension is immune from review—this no matter *to what degree the extent of his disablement may have diminished.* He may of course lodge an appeal for an *increase* and then it may transpire that he has sustained not an increase but a *decrease* in his disablement. Indeed in view of the marvellous powers of *functional adaptation* resident in the human frame, it is only too probable that many a pensioner, judged in light of this beneficent factor, will be found in receipt of a pension " in excess of the amount appropriate to the degree of his disablement."

It will be interesting, therefore, to note whether the pensioner's *degree of adaptation* to the consequences of a disability or infirmity will be taken into account in determining if the amount of his pension is or is not excessive. Inasmuch as the avowed wish of the Ministry is that pensions "be graded in proportion to the degree of disablement," it would indeed be but logical that this factor, *functional adaptation*, should be accorded adequate consideration, and when a palpably high degree of the same has been acquired that the pension be correspondingly lowered. Moreover we may be permitted to observe that article 2, sub-clause (*a*), does, we think, admit of this factor—adaptation—being taken into account in any case coming up for review.

But to return to our point, a man on *permanent* pension is immune from review unless he lodge an appeal. Or, unless the medical examiner or other officer—imbued with a very high sense of his duty to the State—take it upon himself to bring such cases of attenuated disablement as may come under his notice to the knowledge of the Minister of Pensions. Now the rôle of informer is universally abhorred and, as such, will undoubtedly constitute a very definite obstacle to effective administration of sub-clause (*a*). Accordingly it is to our mind clear that if the power of the Minister of Pensions in the *sphere of ordering reviews* is to be adequately exercised, compulsory re-examination of all discharged soldiers on permanent pension is

essential. We say *all*, for if invoked in a limited and, therefore, necessarily ineffectual fashion it would result in unfairness. Some, and rightly so, would have their pension decreased, while others —equally eligible for decrease—would by luck or some fortuitous circumstances escape scot-free. These and other hindrances to efficient administration would disappear if a *system of compulsory review were instituted biennially, triennially, or at more prolonged intervals.* That the procedure in many instances would be purely formal we willingly grant, but nevertheless its adoption in a routine manner would, we apprehend, be advantageous alike to the State and the pensioner, and for the following reasons :

(1) It would ensure a logical application of the basal principle, that the amount of the pension must be in proportion to the degree of the disablement. In other words, it being conceded that aggravation of a disability justifies *increase*, it is but consistent that *amelioration* should entail *reduction* of a pension.

(2) A system of periodic revision would enable the State to keep in close touch with the pensioner, and solution of the many problems associated with his after-care would be correspondingly facilitated.

(3) Through the opportunity thus afforded for closer supervision these further desiderata will be attained :

(*a*) The onerous responsibility thrust upon medical experts through the absence of a time limit would be greatly alleviated, their decisions correspondingly less speculative.

(*b*) The validity of claims lodged for increase of pension on the plea of aggravation could be more easily and more accurately substantiated or refuted.

(*c*) Claims for increase that should, but have not, either through ignorance or other cause, been presented, could be adjusted, and hardship to the pensioner thus obviated.

(*d*) Reduction of pensions, when excessive, could be carried out in a uniform and impartial fashion.

(*e*) The growth of abuse could be checked, and the administration of the pension system conducted on a sound and equitable basis as between the State and the individual.

Nor do the foregoing considerations exhaust the advantages that would accrue through the adoption of periodic and systematic re-examination of pensioners. Can it be doubted that through the facilities thus afforded for their inspection much of the obscurity that now enshrouds the *ætiology* of disease—particularly the causal relationship of *trauma* thereto—will be largely dissipated ? How valuable, too, the acquisition of further enlightenment regarding the *adaptive capacity* of different individuals to he consequences of injury or mutilation ! For the economic

importance of this beneficent factor is as yet but imperfectly realized, and we, as custodians of a vast store of clinical material, owe it to posterity that we utilize to the fullest extent the unparalleled opportunities that now present themselves for research in this and other spheres.

Last, but not least, we could, given compulsory review at stated intervals, gauge the influence for good or evil of permanent pensions on the *morale* of the individual. For in the ultimate resort the touchstone of the success or not of our pension system in the eyes of the impartial historian will be the *moral* criterion. Let us not forget that the abuses, the corruption, that marred the United States pension scheme furnished our own distinguished countryman, Lecky, with his chief indictment of the democratic idea. In presence of this impeachment we would with greater emphasis urge the incumbency of more continuous control of the pensioner, no less in his own interests than in that of national morality.

What'er is best administered is best.

POPE

## CHAPTER VI

## DISCUSSION OF CERTAIN ARTICLES—*continued*

### DISCIPLINARY AND OTHER CLAUSES

"4. *Half the pension and allowances (if any) awarded under the preceding articles may be subject to the condition that the disabled man shall undergo medical treatment in an institution or otherwise, for any period during which it may be certified that such treatment is necessary in his interests.*"—Royal Warrant, May 1918.

A man is often seduced from his real, though haply remote, interests by the allurement of immediate temptations. But it is the duty of those responsible for the administration of pensions to induce, if not to compel men, however reluctant, to consult, not their temporary, but their permanent welfare. The soldier too, on his part, must recognize that *moral responsibility* is the corner-stone of Society.

He has "rights," but also "obligations." He must learn to identify the good of society with his own—he must not be *anti-social.*

Thus, for example, if he be the victim of *tuberculous* disease, not only is his own weal at stake, but the well-being of the community also. Under such circumstances, to refuse sanatorium treatment is to disregard his moral obligations to society. If intelligent, he will recognize that his own good is identical with that of the community of which he is an integral unit. But if, through ignorance or sheer perversity, he be impervious to conviction, blind to his permanent welfare, then a direct appeal to his temporary interests will almost certainly secure his conversion. To this end the pension authorities have rightly, under this clause, invested themselves with the power to reduce the pension and allowances (if any) by one-half.

The essential justness of this procedure cannot be gainsaid. But the principle inspiring the clause—viz. that *unreasonable refusal of treatment justifies reduction of pension*—having been conceded, *uniformity in its application* should, if possible, be secured.

### Application of Clause Selective, not Uniform

From the tenor of the clause it is clear that it is intended only for *sectional* application. Any doubts on this point have been effectually dissipated by the categorical affirmation of the Parliamentary Secretary to the Ministry of Pensions.

"We have taken power to reduce a man's pension by one-half if he refuses the treatment offered to him in cases where he has been certified as requiring some definite form of treatment. We do not propose to exercise this power in order to compel a man to undergo a surgical operation, but only in cases where massage, electric treatment, treatment by machines for straightening out joints, etc., and other gradual processes have been offered, or hospital treatment for the sick."

We could wish that the Parliamentary Secretary had vouchsafed some indication as to the basis upon which such differential treatment of medical and surgical cases was held justifiable. Why this passionate resolve that the offices of the physician shall not be refused, while those of his confrère the surgeon may with impunity be forgone ?

Why this temerity in regard to *medical* as opposed to *surgical* modes of therapy ? Is massage, electricity, or other form of medical treatment, if not frankly beneficial, *always innocuous, always free from danger* ? We trow not. Massage or electricity improperly administered or injudiciously prescribed may do infinite harm ; and needless to say the same hazard attends, and even maybe in greater measure, the many forms of therapy that may be classed under the vague term "medical treatment."

Be the explanation what it may, it is clear that to undergo certain forms of *medical* or so-called physical therapy, when prescribed, is in effect *obligatory.* In other words, any soldier who *refuses* to submit to such therapeutic measures does so *at the risk of losing half his pension.*

On the other hand, to undergo *surgical* treatment, when counselled with due authority, is *not obligatory.* Put otherwise, a disabled soldier, if he refuse to undergo a surgical operation—indifferently whether such refusal be *reasonable* or *unreasonable*—does *not run the risk of losing half his pension.*

Dealing with the broad issue as between *medical* and *surgical* cases, we would ask : Is such *differential* application of the principle fair ? Is it equitable that a disabled soldier who refuses the particular types of therapy specified should be *penalized,* while a comrade who refuses some surgical procedure—equally necessary in his own interests—shall be immune from any reduction of his pension ?

The latter penalizes the State in a triple sense. He thrusts upon it the responsibility of paying him a pension, the necessity for which, had he undergone the operation, might have been obviated or the amount thereof lessened. His unreasonable behaviour may entail loss, partial or total, of his working capacity, and the State is thus deprived of a more or less productive unit. Last, but not least, if he obtain a pension, the success with which he has evaded his moral obligation encourages others to take up the same unjustifiable attitude.

Conduct of this nature is, we think, most reprehensible. Such persons are fully aware that the pension authorities cannot compel a man to undergo a surgical operation, and their limitations in this respect are in grave danger of being exploited. What, too, if the man, after obtaining his pension, subsequently undergo the operation he previously refused to submit to ?

In short, the present attitude of the authorities seems to us untenable. In sheer self-defence the Ministry must face the issue. To shirk the responsibility of deciding whether a refusal be reasonable or unreasonable is tantamount to connivance at what may be fraudulent and at best is reprehensible conduct.

When a similar issue has arisen in the case of a workman claiming compensation for "industrial accident," judges have had to pronounce as to the reasonableness or unreasonableness of the claimant's refusal, and their findings might readily form the basis of adjudication in such instances as they arise in the case of disabled soldiers.

We are well aware of the difficulties that beset this question, and in a later chapter we have dealt in detail with the varied aspects of the problem, and to this we refer the reader. Here, however, we are only concerned with the broad issue, the differential treatment of surgical as opposed to medical cases.

If the present *laissez-faire* attitude is to be persisted in, then the logical and, to our mind, the only equitable course to pursue is to *rescind clause* 4. To penalize one disabled soldier for not undergoing *medical* treatment, and to refrain from doing so in the case of another who refuses *surgical* treatment, is obviously unfair. Put medical and surgical cases on an equal footing—if you penalize one, penalize the other—if not, penalize neither. Otherwise the authorities lay themselves open to the reproach that Posthumus hurled against the gods :

> You *some* permit
> To second ills with ills, each elder worse.
> *Cymbeline*, v, 1

"6. (1) *In any case where it is certified that a disabled man to whom a pension has been awarded under the preceding articles of this Our Warrant should, in consequence of his disablement, undergo any course of medical treatment in an institution or otherwise, or where it is decided that he should, in consequence of his disablement, receive training in a technical institution or otherwise, and he is deemed unable in consequence to provide for his own support and that of his family, there may be granted to or in respect of him, in lieu of any pension and children's allowances, for the purpose of undergoing treatment or training, for such period and subject to such conditions as the Minister of Pensions may determine, either :*

"(a) *An allowance of an amount equivalent to that corresponding to the highest degree of disablement as shown in the First Schedule to this Our Warrant, together with an allowance in respect of each child at the full rate as in article* 2 (1), *and in the case of a man whose treatment or training necessitates the man living away from home, a further allowance which will secure to his wife an amount equivalent to the pension authorized for a widow under article* 11 *of this Our Warrant, or to a dependent supported by him up to the time when his treatment or training commences, such amount not exceeding the amount of ascertained dependence up to* 10*s. a week, and children's allowances as in article* 12 *of this Our Warrant, as may be determined by Our Minister of Pensions ; or*

"(b) *An allowance equal to the maximum pension which would be payable to him under article* 3 *of this Our Warrant if he were without earning capacity, whichever is the greater, provided that an allowance under this subsection to a lunatic soldier may be reduced by the amount which may be granted to a dependent who is not a relative of such soldier, or by such less amount as the Minister of Pensions may determine.*

"(2) *A deduction of such an amount and under such conditions as the Minister of Pensions may determine, may be made from any allowance granted under subsection* 1 *of this article, on account of the cost of the disabled man's maintenance in an institution.*

"(3) *Any charges, fees, or expenses in respect of the treatment or training of a disabled man that are not otherwise provided for may be paid under such conditions as the Minister of Pensions may determine.*"—Royal Warrant, May 1918.

In our projected discussion of the foregoing clauses we purpose narrowing our purview to those portions that relate to the *re-education or readaptation* to work of the maimed or mutilated soldier.

Surely none but the carping will deny that the State has approached this problem with a sympathetic insight and a

catholicity of outlook such as almost disarms criticism. In the liberality of its provisions it has in truth gone on from strength to strength. It admits, not only the right of the disabled soldier to a pension, but also his *right to the means essential to self-development*—rehabilitation in the eyes of himself and of society as a self-reliant, self-supporting, independent unit.

Thus, while *ab initio* the Statutory Committee was, in instances recommended by Local Committees, empowered to grant additional allowances to men undergoing training, nevertheless the boon was not unconditional. Each case had to be scrutinized on its merits, but there was no definite undertaking on the part of the State that opportunities for re-education would be granted to all those wishing to avail themselves of such advantages.

But with the advent of the Royal Warrant of March 1917 this uncertainty was removed. The right to claim facilities for re-education or re-adaptation to work was conceded. Moreover, generous inducements were held out to the maimed soldier to train for skilled work, in that during the progress thereof he receives an increased pension and a separation allowance for his family or dependents with, in addition, a bonus on completion of his course.

Indeed, the provisions of the Warrant of 1918 may fairly claim to have done all in reason to dissipate all the fears that, in the opening years of the war, tended in this as in other countries to deter soldiers from undergoing retraining. The pension and allowances are on such a scale as to remove all anxiety as to the fate of wife and dependents while the course of instruction is proceeding.

Moreover, the fear of incurring *reduction of a pension through increased earning powers* following a course of training has now been wholly allayed. Unfounded apprehension on this score in France, Germany, and this country has admittedly not only led men to refuse training, but, moreover, has caused such as were engaged in remunerative work to restrict their output. The categorical and oft-repeated affirmation of the Minister of Pensions as to the immunity of a permanent pension from any reduction on the ground of increased earnings will do much to dispose of this bogy. His timely and emphatic utterances on this question might well form the starting-point of a vigorous propaganda to disabuse disabled soldiers of this and similar misconceptions.

Moreover, widespread dissemination of the facilities for, and the advantages accruing from, training, and the financial safeguards vouchsafed during its progress, would go far to prevent men from being lured by the current high wages into casual or blind-alley occupations.

That existing provisions for training facilities are perhaps inadequate to meet all demands that may arise may possibly be true. But their amplification proceeds apace, and at any rate at present the difficulty is not to provide facilities for training, but to induce men to avail themselves of such instruction.

## The Response of the Disabled Soldier

Look round the habitable world, how few
Know their own good, or knowing it, pursue.
DRYDEN

In this country, and alike in France and Germany, those interested in the after-care of disabled soldiers have had to deplore the indifference but too frequently displayed by them in reference to this all-important question—their re-education and readaptation to work.

Thus French observers regret that only the best type of men avail themselves of the proffered opportunities; while the ignorant or the feckless, if perchance they find their way to the schools, do but drift aimlessly away after a brief trial. Again, even of those who essay retraining, many seem insufficiently alive to the value of the facilities accorded them, and are prone to rest content with a meagre development of their residual capacities—a falling short of the best that is in them.

Turning to Germany, the same relative dearth of ambition is met with, the indifference in some centres being so marked that projected courses of tuition, through paucity of attendance, have had, perforce, to be abandoned.

Nor can it be gainsaid that we, too, in this country are beset with the same recalcitrant attitude in but too many instances. Thus Warwick Draper, discussing "Village Centres for the Cure and Training of ex-Service Men," observes that while "very probably large numbers" do avail themselves, "there are many who at present rest content with a pension and a sense, not universally worthy of the best in them, of 'duty done,' and are not too eager to respond to offers of training for new jobs in life. But this observation should not be pressed too far, and would be a slander on very many."

Again, Dudley B. Myers remarks that "not more than 25 per cent. of the men that are being invalided out of the Service are ready at first to undergo any full course of technical training." Continuing, he remarks: "I have little doubt that after the war, when the general labour conditions are entirely changed, many a man will thankfully accept training who could not be induced to consider it at the present time."

But reflection on these somewhat discouraging experiences must not be allowed to engender despondency. The pessimism and despair that may cloud our consciousness as long as we see only the incompleteness of our actual achievements, must lead us, not to renounce, but to pursue with renewed ardour our ideal. For we " have glimpses that may make us less forlorn," shining examples who, emerging from lethargic despair, have become literally transfigured, ennobled by the dignity of labour, the realization of dormant and haply undreamt-of capacities.

## Should Training be compulsory?

In view of the truly altruistic nature of the feeling that animates our crusade on behalf of the disabled soldier, it is but natural that some—profoundly stirred by the necessity, the essential rightness of their endeavour—should seek to compel recalcitrant soldiers to undergo training.

In the French Chamber, indeed, proposals have been made that attendance at such courses of instruction should be made compulsory, and, apparently, neither in this country nor in Belgium have the authorities any doubt as to the propriety or legality of such compulsion.

But in France, though it is currently held that professional training is *compulsory*, it is nevertheless doubtful if the powers of the State in this direction are frequently, if ever, invoked. Moreover, when we turn to Belgium we have the further fact that compulsory re-education, when resorted to, has been followed by somewhat mortifying results.

Indeed, some frankly declare that it proves abortive. Thus M. Alleman, Director of the Belgian Institute for Disabled Soldiers, declares: " Compulsion should never be employed. In certain schools 80 per cent. of failures have occurred through misapprehension of this principle."

Reverting to our own country, a recent writer remarks that " the authority of the State cannot compel disabled men to learn such trades or follow such pursuits as will restore them to their highest possible degree of vitality."

The writer from whom we quote this passage seems rather to revel in the State's impotence, thus he continues somewhat censoriously: " If anybody should doubt this, it is at any rate certain that neither in this country nor in France, nor, again, in Germany, where the State does so many things, will it now undertake this task which has been deliberately judged impossible. Nor can philanthropy, with any taint of patronage or of impertinent meddling, achieve the task."

One turns with relief from this categorical, almost truculent pronouncement to the more measured declaration voiced by the Inter-Allied Paris Conference: "Only obligatory re-education can entirely solve the problem. But considering that this obligation encounters in certain countries resistances difficult to overcome immediately, it expresses the wish that the public authorities will promote occupational re-education and the retaking up of work by all appropriate means." How refreshing this compared with the former utterance—its reluctance to regard a rational solution of the problem as entirely without the range of practical politics!

We arrive, then, at this impasse, that individual countries, including our own, find it inadvisable or impracticable to compel training. Yet a representative Congress, with authorized delegates from all the Allies, as the outcome, presumably, of mature deliberation, declares that the problem admits of no other wholly satisfactory solution. We may take it, then, that if our crusade on behalf of the readaptation to work of the disabled soldier is to be crowned with the success it merits, *compulsion* apparently seems necessary, though at present unattainable.

## Persuasion, not Compulsion, the True Solution

Surely persuasion, not constraint, is the "Open, Sesame!" the key to that inner chamber wherein man's resolutions, whether for good or ill, take form. If we would enter the hush'd region of *moral imperatives* we must walk circumspectly. For the success that awaits us will be proportionate to the delicacy with which we appraise the psychological content of the maimed or disabled soldier.

No time this for Sinaitic denunciations, but "through the darkness the sound of a human voice," sweet with sympathy, vibrant with hope. A task fit only for him who can enter into and appreciate the widest, the deepest interests of human life. For none less than this our quest—our Holy Grail—the redemption of the maimed, the halt, the blind! Surely no Arthurian knight had loftier, worthier talisman than this—to plumb the secret depths of human character, bring to light and fruition hidden potentialities of mind and body!

Well equipped indeed should we be if we would essay the restoration of the maimed or mutilated soldier to his pristine level! Many are the obstacles we must o'ercome—endless the inroads upon our patience, tact, and persuasive powers. Giving full range to our sympathy and compassion, our whole endeavour must yet be centred upon relief in the truest and highest sense.

To instil self-confidence, kindle anew lost hopes—in short, *revivify*—is our rôle.

If the soldier refuse to undergo training it is our office to unearth "the moving why" he does so. For while a man's will is in truth the reflex of his character, yet our moral estimate must not be harsh, but kindly-tempered by sympathetic insight into his actual condition. The victim of shattered nerves, he may not be fully master of himself, rejecting in petulance what later he will with gladness embrace. Crises of despair sweep o'er him, but wait! anon the cloud lifts and the mind is seen in health again.

Another, "musing full sadly in his sullein mind," is intolerant of intrusion upon his brooding melancholy. Long sequestered, too, from the petty businesses of life, he resents the call to activity. This especially if there be a show of dictation about the request, a tinge of command. How coerce such a one, save only by sympathy and tactful appeal to his better self? There must be no offensive display of using their influence by those in power, no assumption of intellectual superiority in pointing the way. To rouse the disabled soldier from his inertia, to stir him to thought and action, is our aim, but not necessarily to impose on him *our* conceptions of what he ought to do or learn.

*Ignorance, lack of intelligence, or deficient moral sense* may be the stumbling-block—grave obstacles all. The more so in that to them are superadded the endless caprices, the vagaries of all convalescents, whether soldier or other. For "to be sick is to enjoy monarchal prerogatives," and to be relegated to "the elbow-chair of convalescence is a fall from dignity amounting to a deposition." We must be chary of breaking in brusquely on a whilom invalid's dreams lest we fail of our purpose—arouse opposition where we would fain enlist cheerful, willing comradeship.

What, too, our attitude when called to guide the subject's *choice of occupation*? To take too narrow a view, be obsessed by his particular mutilation or disability, may be to blind ourselves to latent capacities lying fallow for lack of tendance. Forsooth, to assume the rôle of mentor is presumptuous unless we envisage in a catholic manner the man's possibilities. We must seek out, have a keen eye for faculties *in posse*, hidden talents that will open out a new vista of fruitful effort.

Lastly, we should ever be loth to accept as *final* a man's refusal of training. We must strive to bring home to him the natural or logical outcome of such unwisdom—the retribution that follows the "unlit lamp, the ungirt loin." Our responsibility here cannot be lightly weighed nor shirked. Gratitude alone, to

him who has risked life and limb on our behalf, forbids that we dismiss his future unconcernedly.

Apart from this, upon each and all in contact with the disabled soldier rests the obligation of achieving his Renaissance, and through him the reshaping of national life. In essence very human and personal this task—to woo the unwilling back to *Work*, the Lethe of dejected souls. Not to be attained vicariously by the passing of Acts, but by "those sovran privacies of speech" which win through the outer husk to the inner man with whom we would take counsel. Only when we can assure ourselves that we have left no stone unturned, naught unsaid or undone that might have redeemed his life from idleness or purposeless activity, should we hazard a *moral estimate* of his conduct.

> Not on the vulgar mass
> Called "work" must sentence pass,
> Things done, that took the eye and had the price;
> . . . . .
> But all, the world's coarse thumb
> And finger failed to plumb,
> So passed in making up the main account;
> All instincts immature;
> All purposes unsure,
> That weighed not as his work, yet swelled the man's amount.
> Thoughts hardly to be packed
> Into a narrow act,
> Fancies that broke through language and escaped:
> All I could never be,
> All, men ignored in me;
>
> This, I was worth to God, whose wheel the pitcher shaped.
>
> BROWNING

## Refusal of Training—if unjustifiable—should be penalized

> Ten thousand harms, more than the ills I know,
> My idleness doth hatch.
>
> *Antony and Cleopatra*, i, 2

We have, we trust, in the foregoing paragraphs, adequately emphasized the necessity of approaching intelligently and sympathetically this difficult problem. But while permitting the soldier in this matter as much latitude as possible, we must, in the interests of public morality, discriminate between *justifiable* and *unjustifiable* refusal.

We must beware of tolerating or appearing to tolerate a vicious proclivity to idleness. The State cannot, even if it were desirable, maintain in *indolence* all those disabled through military service. The intent of the State in awarding a pension is not

that the recipient may live in sloth thereon. It is rather of the nature of *part compensation*, intended to relieve him of a handicap, so that he can live in competition with his fellow-men.

A disabled soldier, if he is to be employed, must be *employable*, hence the provision by the State of facilities, when necessary, for *re-education*. But what if, after exhaustion of all powers of persuasion, he refuse to undergo training, electing in preference to live idle on his pension. What is to be our attitude towards such a recalcitrant ?

On this point the Parliamentary Secretary to the Ministry of Pensions delivers himself as follows: "As regards training, we do not propose any penalty if it is refused, since though a medical board or doctor can certify that a particular kind of treatment is necessary with authority, nobody can give a similar certificate about training and can say that a particular man ought to learn a particular trade."

Now while it may be admitted that no medical board or doctor can certify that a particular man ought to learn a particular trade, still we take it that this or any other body of intelligent opinion would hesitate to deny that the ideal end of moral life is *self-realization*. This, not only in an egoistic, but in an *altruistic* sense. In other words, they would have no qualms in affirming that the real and permanent welfare of the soldier—self-realization—is more likely to be attained through *work* than through remaining idle on a pension.

We are faced, as before stated, with a period of ruthless economic competition 'twixt the nations. If we are to hold our own in the coming strife, every man that can, must contribute his quota to the maintenance of *national efficiency*. Surely, if we had a right to compel a man to risk his life to maintain the integrity of this Empire, we need have no compunction in demanding the lesser sacrifice—viz. that in the longed-for peace he shall, to the utmost of his capacity as a productive unit, promote the prosperity of that same Empire for which he fought. For assuredly his truest and best interests in both events are identical with those of the community of which he is an integral unit. A man's refusal of training, when fully aware of what he is doing, is the reflection of his own character. It is impossible to go behind this character and fix the responsibility of the consequences of his action on some one else. We have in our mind, of course, the man who deliberately prefers to *remain idle on a pension to acquiring a trade and obtaining wages plus his pension*.

We must adopt a virile, not a purely negative, attitude in dealing with such refractory persons. "We do not propose any penalty if training is refused," savours too much of weakness.

To assent and to comply with unreasonable *anti-social* conduct of this nature is surely the very worst course to adopt. It is impossible to support the purity and dignity of public morals without opposing such reprehensible tendencies on the part of individuals. The will or actions of a child are restrained by its parent, and is not the behaviour under review but a further proof that " men are but children of a larger growth " ?

The reluctance of the State to compel men to undergo training is presumably their fear that such action on their part might be construed as an intolerable and unwarrantable interference with individual liberty. This is, therefore, a matter on which it is important to develop a strong and sane public opinion. We must not be obsessed by " that treacherous phantom men call Liberty "—and this to the extent of compromising with vice.

Considerations of public morality forbid the individual an unlimited liberty of action. No human being stands entirely isolate—each and all are more or less affected by ties of family or the State. Legally speaking, a man can do what he likes with his own, but morally he is under the obligation to use his own for the general good. As Mackenzie rightly observes : " A man's rights are nothing more than those things which, for the sake of the general good, it is convenient he be allowed to possess." In our opinion it is not convenient that a man, either in his own interests or those of society, become a total burden on the community. Such a man may prate about liberty, but what he has in mind is *licence.*

Now the State, in the matter of the disabled soldier, clearly regards itself as *in loco parentis,* and surely here is an instance in which it may without fear or favour take a strong hand. As before stated, the Inter-Allied Paris Conference affirmed that compulsory re-education provided the only true solution. But while this is in all probability true, its adoption, as we have seen, is unlikely. Nevertheless we would suggest that the State, if it does not compel re-education when desirable, should at any rate *penalize* unjustifiable refusal thereof.

A pathological state of body we attack with all our resources, then why remain supine before a problem of moral pathology ? Look, too, in what practical fashion the Ministry of Pensions resents any refusal to undergo *medical* treatment if unreasonable. It does not hesitate to reduce the pension and allowances, if any, by one-half. Yet despite its passionate proclamation that *Restoration* is its watchword, it is content to look on impotently when a man refuses to avail himself of the chance of becoming an efficient, self-supporting member of the community.

Why not apply the same means of inducing reasonable

acquiescence—viz. *reduce the pension by one-half if a man unreasonably refuses the boon of training.* For does not such a refusal show a vicious proclivity—a preference for idleness on a pension to work with a pension plus wages.

> What is a man,
> If his chief good, and market of his time,
> Be but to sleep and feed ? A beast, no more.
> Sure, He, that made us with such large discourse,
> Looking before and after, gave us not
> That capability and godlike reason,
> To fust in us unused.
>
> *Hamlet*, iv, 4

## Pensions when Disablement takes Effect after Discharge

"*If a man after discharge from the Army is certified to be disabled owing to :*

"(a) *Wounds or injuries received in the performance of military duty in consequence of the present war ; or*

"(b) *Disease, certified as contracted or commencing while on active service or as having been aggravated by active service in consequence of the present war ;*

*such disablement not having been caused or aggravated by the soldier's serious negligence or misconduct, he may be granted a pension as if he had been discharged as medically unfit for further service upon the date from which his claim is established.*"—Royal Warrant, 1917, article 9.

All will agree that if a soldier at any time after discharge develop a disability or infirmity attributable to military service, or haply incur aggravation of any pre-existing morbid state or disorder, he is rightly entitled to a pension on account thereof. Still our solicitude must not blind us to the danger that besets all pension schemes—viz. that their benefits may be extended beyond the point contemplated by the Royal Warrant or provided for by the administrative machinery. This is precisely the pitfall that those responsible for the administration of this particular article will be exposed to, and we fear that such modifications as have been introduced in the corresponding article in the Warrant of 1918 in no way minimize the likelihood of this contingency. For, as will be seen, the provisions relating to pensions when disablement takes effect after discharge, remain in essence unaltered, open to the same menace.

"*If a man after discharge from the Army suffers from a disablement which is certified as either attributable to or aggravated by*

*military service during the present war, such disablement not being due to the soldier's serious negligence or misconduct, he may be granted a disablement pension or a gratuity or temporary allowance under article* 1 *of this Warrant as if he had been discharged as medically unfit for further service upon the date from which his claim is established.*"—Royal Warrant, 1918, article 9.

### *The Absence of a Time Limit*

The expression " after discharge " is obviously indefinite, and as such constitutes the salient flaw in the article under review. In light of this absence of any time limit we cannot but wonder at the temerity of those who anticipate that our expenditure on pensions will follow its normal course—viz. *after an initial rise suffer a gradual decline.* For what more calculated to dislocate this hoped-for orderly sequence than this particular article—so ill-defined, so elastic of interpretation.

It is not now in the living Present, but in the future—in two to three decades hence—that the dangers resident therein will become manifest. By then the soldier of to-day will be trenching upon—if he have not reached—the meridian of life. His bodily energies will be on the wane, and, conscious of the strain imposed by younger and more lusty rivals, he begins to feel himself " written down old with all the characters of age." Depressed thereby he lives o'er again his old campaigns, bethinks him of bygone hardships heroically endured, and falls a prey to mingled despondency and resentment. Pitying himself as " the forlorn soldier that so nobly fought," what wonder if he casts around for some material token of a nation's gratitude ? Into his gloom there creeps a ray of light ! Surely that twinge of rheumatism had its origin in the service ; this cough, this breathlessness, were not the seeds thereof to be sought in the Valley of the Somme, its sodden snowbound trenches ?

How difficult to decide whether these aches and pains, these disabilities, are the outcome of long-past military service, or but the appanage of increasing years ! The picture is not overdrawn, and it seems to us inevitable that in this absence of a time limit we shall eventually find ourselves granting pensions for *senile decay* !

Well will it be with us if in some twenty years hence the smooth forecasts of to-day as to the rise and wane in our expenditure on pensions prove not illusory ! But we fear that unless some safeguard be introduced we shall, like our American Allies, find to our cost that the passing years bring, not the wished-for decrease, but an *increase* in the public charges in this sphere.

### *The Difficulties from a Medical Aspect*

Verification of the *origin* of a disability is frequently a matter of the utmost difficulty. This especially if the question at issue does not come up for settlement until years have elapsed since the alleged cause or causes were, so to speak, in action. Broadly speaking, it may be without doubt affirmed that after the cessation of hostilities the task of establishing the all-important point, whether or no a discharged soldier's disablement *is attributable to or aggravated by military service*, will with each passing year become more arduous, more and more intricate.

Many and divers are the problems that will be offered the medical expert for solution. He will be confronted with the same difficulties that our American confrères had to face after the passage of the "Arrears of Pensions Act," and so graphically illustrated in a passage written by one of them in 1886: "How much likelihood is there, for example, that to-day's advanced tuberculous disease of the lung depends upon the exposures of camp life or the pneumonia of '63? Is the present hepatic or renal disease a legitimate result of army life, especially in view of the fact that the man is evidently a hard drinker? Are the varicose veins of the leg or the scrotum due to hard marching or rough riding, or are they the result of occupation or of developmental changes that took place at and about the period of puberty before the man went into the army? Again, is not the present disability the result of syphilis or gonorrhœa, and therefore not incurred in the line of duty?"

In the same way to-day, all thoughtful medical men realize that in the *absence of a time limit* they will in many instances be compelled in common honesty to affirm a *non possumus*. The French experts, Duco and Blum, do but voice the disquietude of many when they envisage the variety and intricacy of the questions that will come up for decision in this sphere, in the after years of peace.

How, for example, shall we determine the exact effects of the casualties of war upon the general health of the victims? What of the *foreign bodies* ignored and then revealed ultimately by *radiography*? What is their relation, if any, to the subsequently developed disorder of the lung or brain? Is it not sufficiently clear even at the present time that in certain cranial injuries, even though of trivial character, radiography reveals in the brain an osseous splinter, a metallic fragment, whose presence was unguessed at? Traumatisms may not only provoke disorders *previously non-existent*, they may also aggravate *pre-existing disorders*. Here arises the question: Has the pre-existing

illness been clearly aggravated by an accident of war, or may it not be that the aggravation is but incidental to the *normal mode of evolution of the primary affection* ?

The difficulties, as they point out, are but accentuated when we pass outside the range of well-ascertained *trauma*, and attempt to weigh up the etiological valency of those imponderables—*military fatigues and hardships*. That these intervene as causal factors, direct or indirect, in the genesis of certain maladies is well recognized. But in middle-aged or old soldiers, how difficult —nay, how impossible—will it often be to decide whether their infirmities are the outcome of military hardships, or but the accompaniments of advancing years ?

Already in these early days we have, as the Nemesis of slip-shod recruiting, to face this tendency to impute all and sundry ailments to military service. Thus in regard to the Royal Defence Corps an R.A.M.C. officer gives vent to the following lament : " The corps contains a number of men who joined at an advanced age and are now getting pensions on the ground that they are incapacitated by rheumatism and kindred troubles, which have, they say, been contracted during their service. Yet it is clear that most of them have been far less exposed to the weather in the R.D.C. than they would have been in their civil-life jobs as outdoor labourers, ploughmen, bricklayers, and so forth. This is, of course, analogous to what has happened in tens of thousands of cases in the Army. Pensions have been granted to men who ought never to have been enlisted, and for two or three generations to come the nation will be burdened with a heavy annual charge through the stupidity of the recruiting authorities."

Not pleasant reading this, and it would seem to augur ill for the future stability of the pension scheme. We have introduced the passage to emphasize the difficulties that even *now* confront us. But what of the future ? We must, of course, expect such claims if we admit into the Services men of advanced years. But the point we would emphasize is that if in men such as these—*recently enrolled*—we are or seem unable to effect the all-important discrimination, whether or not their infirmities are attributable to military service, what of the far more difficult problems presented by similar cases coming up for judgment some *ten or twenty years after the cessation of hostilities* ?

### *Safeguards against Abuse*

In their recent report on the administration of the Ministry of Pensions, the Select Committee on National Expenditure point

out with regard to article 9 (Royal Warrant, 1917) that such a provision, *not restricted by any time limit*, may open the door to grave abuses.

To the end of obviating imposition and safeguarding the public purse, they hold it essential that immediate steps should be taken to prevent fraudulent or ill-founded claims in the future.

Their recommendations are embodied in the following resolutions :

"*That the administration of article 9 of the Royal Warrant, which allows a claim to be made for a pension at any future time on the ground that health had been injuriously affected during the present war, should be carefully and continuously watched by the Treasury. The existing practice with respect to the records obtained of the men's physical condition on discharge and the means of securing identification should be reviewed.*"

In his reply the Chancellor of the Exchequer assures the Committee that the Treasury will be vigilant in supervision. He also states that in cases arising under this article, the *onus probandi* that the disability in regard of which pension is claimed *is attributable to military service* clearly falls on the applicant. He adds also, that to prevent *personation* the Minister of Pensions is at pains to discover the best method of securing the identification of claimants in such cases.

In reviewing the recommendation of the Select Committee, their suggestion that " the existing practice with respect to the records obtained of the men's physical condition on discharge and the means of securing identification should be reviewed " is very much to the point. It is obvious that, in claims lodged years after the alleged causal factors were operative, our power of arriving at a decision as to the validity of the allegation will depend on the nature of the evidence that can be culled from the records obtainable as to the claimant's physical condition on demobilization.

It is clear that unless the existing machinery for securing a *searching examination of all soldiers on discharge* be thoroughly adequate it will certainly follow that many claims will be held valid on purely *negative* grounds—viz. because of lack of positive evidence to the contrary.

That the Select Committee have doubts as to the adequacy of the present arrangements is clear in that they call, and very rightly, for their review.

Hasty and perfunctory examination is valueless in light of the fact that to meet the possible eventualities arising under article 9, not only must we note carefully the *existing state of health*, but we must also apprise ourselves as to the *morbid poten-*

*tialities*, if any, of the individual under review. To compass satisfactorily such a review takes time, and is not to be undertaken against time, and the efficiency of the officer gauged by his *celerity* rather than his thoroughness. *An adequate personnel is therefore essential.*

The interrogatories embodied in the schedule of examination should include *specific inquiries* regarding the *conditions of service* actually undergone. For many of the infirmities in regard of which pensions are claimed are referred to those imponderables, "military hardships and fatigues." In default of any such evidence in all cases of this nature the claimant gets the benefit of the doubt—passes automatically on to the Pension Roll. How diverse, too, the maladies alleged to be of traumatic origin! What a field is here presented for *false imputation*!

Says Gordon Gullan regarding compensation for injuries: "I have personally known carcinoma of the stomach alleged to be due to lead-poisoning, cancer of the pylorus, pernicious anæmia, two cases of marked mitral stenosis, atheroma of arteries, advanced phthisis, and well-marked secondary syphilis with night headaches, all said to be due to accidents, some comparatively slight. And all these have had to be contested, because medical men have given them their support." This observer's remarks are quite pertinent to the point at issue, and who can doubt that many similar allegations will form the basis of claims for pension.

Accordingly the *history* and *exact location* of all *blows or contusions* call for particular note, and questions should be inserted and so framed as to elicit these data. For such in later years may be of the greatest value in traversing or establishing the claim that such and such a lesion—a growth or tuberculous focus, etc.—developed at *the site of a blow or contusion received while on military service.*

### *Attestation by the Soldier as to his Fitness on Discharge*

In view of the grave possibilities of abuse under article 9, there can be no doubt that every justifiable method of circumventing fraudulent claims should be adopted. We have, too, a precedent for the procedure above suggested. Thus all soldiers who served in the Spanish-American War and in the insurrection in the Philippines were subjected to the following regulation:

On mustering out each soldier was required to *sign an affirmation stating whether he was in good or bad health, and if the latter, wherein it consisted.* The commanding officer was a witness to the transaction, and subsequently he underwent a *medical* examination. This latter was carefully undertaken with an eye

to *future* demands for pensions. The American writer, Burton J. Hendrick, from whom we quote, observes that "in the great majority of cases the soldiers testified that they had no disabilities, and the examining surgeons confirmed these statements."

It was hoped that this dual testimony forthcoming from the subject and the expert would be an efficient protection against fraudulent claims. Unfortunately it is impossible to draw a correct inference as to the value or not of this method of defence, as the results were vitiated by the intrusion of a corrupting factor which will, we trust, never effect a lodgment in this country—the *pension agent.*

As the writer from whom we quote remarks, the fact that these statements by the discharged soldier and the examining surgeon, as to the claimant's healthy condition on discharge, reposed in the war archives in Washington did not dishearten the pension agent. "When the soldiers began to return from the Philippines, in 1901, San Francisco became the great American pension hunting-ground. Two of the largest pension agencies in Washington closed their national offices and moved *en masse* to the Pacific coast."

In regard to this suggested attestation of the soldier as to his fitness on discharge, it may be retorted that it would provoke introspection and lead to the voicing of complaints that would otherwise never be mentioned. On the other hand, far better that they should be ventilated *then* than later. As it would be obviously much easier to investigate the verity of the same at the *time of discharge* than it would be *some years hence.*

The fact that it would incidentally promote more thorough medical examination could not fail to be beneficial, both in the interests of the State and the individual. We have already suffered so much through perfunctory examination *prior to enrolment* that it is incumbent on the authorities that they do all in their power to minimize or obviate the equally grave consequences of *careless or too hasty examination on demobilization.*

### *Investigation of Post Bellum Claims*

It is the absence of a *time limit* that renders article 9 so open to grave abuse, for *pari passu* with the gliding years the difficulties presented automatically increase. It is this that has led so many students of the Warrant to question the wisdom, though not the generosity, of this omission.

It is, as we have said, of course undeniable that no matter how long the period that has elapsed, if it can be established that a disablement is due to or aggravated by military service, the

quondam soldier is entitled to a pension. On the other hand, some regard must be had to the limitations of human capacity—the disabilities under which the medical expert labours. In a sense the more scientific his bent of mind, the more lofty his moral code, the more often will he feel it incumbent on him to adopt a non-committal, a *non-possumus* attitude. How quickly will the more unscrupulous claimant appreciate his situation, his dilemma. We can fancy him soliloquizing as to his chances, his almost certain immunity from detection: "Well, in any case if I say it was due to Service, he can't say it wasn't, and I get the benefit of the doubt!"

We must confess, therefore, to cordial sympathy with the recommendation advanced by the Select Committee on National Expenditure in regard to "men who claim that their health has been worsened by military service." They are of opinion "*That where a man claims that his health has been worsened by service some evidence should be required that this is the case or that the conditions under which he has served have been such as to justify that presumption; it should not be assumed to be so merely because good evidence cannot be adduced to the contrary. In cases of real doubt, the benefit should be given to the man.*"

We cordially endorse these suggestions with their implied condemnation of the automatic relegation of such cases to the pension list on purely negative grounds; and fully agree that a more judicial attitude should be adopted in regard to such claims.

The reply of the Chancellor of the Exchequer to the above recommendation runs as follows: "*Where a man claims that his health has been worsened by service, steps are now being taken to secure careful medical examination of the papers where there are reasonable grounds for doubt. Unless it is clear that there is a balance of evidence that the disability is not due to service, or has not been aggravated by it, the benefit of the doubt will be given to the man.*"

Our apprehensions as to the intrusion of abuse under article 9 would have been more effectually allayed if the steps now being taken to secure careful medical examination related, not to "the papers," but to the *men*—the claimants. Sound records rest on sound examination, and it is futile to expect the former unless we ensure the latter.

### *The Need of Special Interrogatories to elucidate Post Bellum Claims*

If it be necessary, as we maintain, for the proper elucidation of cases arising under article 9 that there be a more searching

examination on *demobilization*, it is, we think, clear that still greater stringency should be practised when investigating validity of alleged disabilities *taking effect after discharge*.

The unravelling of these often tortuous cases calls for special care, and an intimate knowledge more particularly of the ætiological relationship of trauma to maladies and local disorders of diverse character. In our work on "Malingering" we deplored the relative dearth of our knowledge in this sphere, and suggested that "a statistical bureau should be established in which might be accumulated and analysed all cases of disease in which injury direct or indirect was alleged to be a causal factor." In research of this nature we lag far behind Continental experts, and we doubt not that our deficiencies in this respect will become painfully apparent to the laity as well as ourselves when we come to adjudicate the valency of claims of disablement *taking effect after discharge*. How great the opportunity now vouchsafed us of attaining to a greater measure of exactness in our knowledge of the remote sequelæ of trauma!

To achieve this desired accumulation of much-needed data, and simultaneously to render more pertinent our inquiries in such cases, we would urge the adoption of a *special code of questions* formulated with the direct object of elucidating the particular point at issue.

In our work above quoted from we have, with an eye to these requirements, dealt in detail with the proper lines on which to conduct the examination of such belated claims, the *valency or not of the alleged ætiological cause*. For while we should in these cases have due and generous regard for the rights of the discharged soldier, we must, in the interests of the State, also recollect that the temptation proffered under this article is blatant, and that the responsibility lies heavy on us as a profession to do all in our power to unmask and render effete fraudulent or unjustifiable demands upon the Nation's bounty.

BY THE COURTESY OF B. M. J.
BRITISH MEDICAL ASSOCIATION

## CHAPTER VII

# MODE OF PROCEDURE IN EXAMINATION OF CLAIMS FOR PENSION

### Reality of the Disability or Infirmity

DISTASTEFUL as it may be, we have to recognize the frailties inherent in human nature; and of these perhaps the most repellent is *Deceit*. For deceivers are alike the most despicable and the most dangerous members of society; they trifle with our best affections, violate the most sacred obligations. Men have recourse to Deceit from a variety of motives, and in the majority of instances for purposes of gain. There is, has been, and always will be an ambition to gratify, an interest to serve, an advantage to obtain, a duty to avoid, a penalty to escape—in short, a motive for deception. For ourselves it is with that specific form of deceit—*Malingering*, or the simulation of disease—that we are concerned.

In the *industrial* sphere, *monetary gain* is responsible for most frauds relating to health. The workman, if he does not actually provoke illness, exaggerates its severity, or even actively prolongs its duration, to secure the wished-for end—idleness, with its associated *sick benefit* or *compensation*. Turning to the *military* sphere, the motives which prompt soldiers or sailors to malinger are most diverse; but in the majority of instances they resort to simulation in order to obtain their *discharge* from the Service *with or without a pension*.

Superficial thinkers have too readily assumed that malingering is the special product of the Workmen's Compensation Act, and doubtless under its fertilizing influence the noisome weed has grown apace, casting its baneful shadow athwart the path of humane and altruistic legislation. But as to its origin, it is clear that malingering is as old as lying, and if it be a question as to whether the installation of *Compensation* or the institution of *Pensions* is the more responsible for its genesis or growth, it is the latter, not the former, that must be impugned.

For in ancient Greece and Rome, as in our own times, the most prolific source of malingering was the *wish to evade military service*, or, when once enrolled, to obtain *discharge therefrom*

*with a pension.* Hence it is that up to comparatively recent times the study of feigned disorders has been almost wholly confined to naval, military, and prison surgeons.

## Pension Scandals in Relation to the Peninsular War

No one who peruses the virile Pension Warrant of 1829 can help remarking the detailed manner in which it enumerates the fraudulent practices resorted to by soldiers and sailors to obtain pensions and alike the uncompromising severity with which it condemns the malingerer and all his works.

Nevertheless it was not until the following year that these particular modes of fraud were grouped together under the term *Malingering* and as such specifically noted in the Articles of War.

The penalties incurred included the possible *forfeiture of all claim to pension*, but from our point of view the most significant fact is that not until *some years after the close of the Peninsular Wars* were the *prevalence* and *gravity* of such corrupt practices adequately appreciated. Now it would be the height of folly on our part to neglect the lessons of previous wars, and we make no apology for a somewhat lengthy quotation from Gavin's work on "Feigned and Factitious Diseases," which appeared in 1848:

"The wars at the commencement of this century, the system of conscription in France, and in different ways imitated by other nations, the practices of balloting, drafting, recruiting, and impressment, the systems of bounty, half-pay, and pension, operated most powerfully in various ways in producing *feigned* and *factitious* disease. The great extent to which this practice of feigning and dissembling disease and disability prevailed, the frequency of its successful imitation, the great pecuniary loss and numerous bad effects of the successful examples of fraud and imposition upon the discipline of the Army and Navy, have been the means of forcibly directing the attention of the military and naval medical officers to the observation of feigned diseases and the best means of detecting them, and have thus rendered their study an important branch of the education of the military and naval surgeon. It is his duty to protect the public service from impositions of this kind—a duty, indeed, which scarcely needs to be dwelt upon, seeing that it is well known to what a serious extent, during the late prolonged wars, the service both of the Army and Navy suffered from such impostures being oftentimes successful, and *how onerously the Pension List was burthened by men quite unworthy of its advantages.* This fact may in some measure explain the singular circumstance that there are now *as many soldiers on the Pension List as on the Army Roll*, which

state of things, entailing as it does a vast expenditure, has produced public declarations of 'the invaliding and pensioning of soldiers having been conducted *ignorantly, unjustly,* and *extravagantly.*'"

The sharp criticism with which the above passage closes appeared in the *Lancet*, April 6, 1839, and it is clear that if we—as a profession—are to escape being charged with ignorance, injustice, and extravagance, we must not fail to institute the most careful examination of all candidates for pension.

For every instance in which fictitious or fabricated disease escapes detection and punishment becomes, not merely a reward granted to fraud, but a premium held out to future imposition. Success excites enterprise, and where many attempt fraud some will gain their end. Hence arises the necessity of our being extremely careful not to allow an impostor to escape—*and with a pension*—for his good fortune will assuredly serve as an encouragement to others.

## Similar Abuses in Relation to the American Civil War

Perhaps one of the most significant facts to be noted in the matter of pensions is the following anomaly—observed in sequence to the Napoleonic and other wars of any magnitude. Thus, following the cessation of hostilities it was expected that in the very nature of things the expenditure on pensions would take the course of *an initial rise followed by a gradual decline.** This forecast was, however, falsified by experience, and in our own country Marshall, to his astonishment, found that the Pension List had steadily increased during a prolonged period of profound peace. His investigations of this unlooked-for eventuality led him to believe that imposition was in no small measure responsible.

A more recent and still more striking illustration is, however, afforded by the data forthcoming under the United States Pension Scheme.

A year after General Lee surrendered at Appomattox there were on the Pension Roll 126,722 men and women—entailing an expenditure of $15,450,550. Exactly forty-four years after Lee's surrender, viz. 1909, the number of beneficiaries had risen to 946,914, involving the payment of $161,973,703. In other words, as a recent writer discussing these figures observes, "the

* We note that the Select Committee on National Expenditure, in the course of their Report on the Ministry of Pensions, venture upon the following statement, which we trust will not be falsified by experience: "The financial charge for pensions will be at its highest point in the year following the termination of the war, after that it will show a great diminution." (February 1918.)

people of the United States are to-day paying out in pensions annually to men and women presumed to have suffered through a war fought out and finished forty-five years ago *a sum ten times as great as that paid out in the year immediately following the war.*"

This congestion of the Pension List naturally engaged the attention of successive Commissioners of the United States Pensions Bureau—each and all bemoaning the development of frauds of every character in connexion with pension claims. In 1875 one of President Grant's Commissioners reported: "During the fiscal year 1530 claims were investigated by the special agents of this office. Of those cases in which pensions had been paid, 309 were found to be fraudulent." In 1878 Commissioner Bentley out of 609 pensioners found that in 393 their claims were altogether fraudulent. A medical board in Baltimore had the unusual experience of meeting with 32 consecutive claimants for pension, all of whom were found to be suffering from valvular disease of the heart. An independent examination showed that all the 32 subjects possessed perfectly sound hearts.

Naturally the *medical profession* in the United States, as in our own country, was held responsible in no small measure for the successful imposition practised by claimants. Thus in 1877 the *pension surgeons* in the United States Pensions Bureau were the subjects of the most caustic criticism, by the then Commissioner of Pensions, who reported: "Some use their commissions to serve their private interests rather than to serve the public by seeking to draw to themselves by advertisement and other means the examination of as many pensioners as possible."

Nor can it be gainsaid that these strictures, severe as they are, were in no small measure well merited. For it is well recognized that in the years succeeding the Civil War the two learned professions—Law and Medicine—found themselves in most ignoble collusion. The *pension attorney*, through the medium of his "cappers" and "runners," scoured the country for disabled soldiers, raking up every possible candidate, and setting his wits to discover some flaw or niche in the Pension Laws which would ensure enrolment thereon of the claimant, whether deserving or otherwise. To the dishonour of the medical profession, too, unscrupulous surgeons spent their energies in discovering some physical disability or infirmity that could by any chance be affiliated to military service. "Thousands of soldiers who had been no nearer a battlefield than a home camp, and who had hardly even smelt gunpowder, easily magnified a reminiscent twinge of rheumatism or a slight palpitation of the heart into disabilities received in the service of their country." Continuing,

the writer sarcastically remarks: "The pension doctor laid all science under tribute to prove the fact. These 'veterans' ran no financial risk, they had only to sign a paper; if they won they had a steady income for life, if they lost they had no fees to pay; the Government paid for the physical examination, and the attorneys got nothing unless the claims were allowed. It is hardly necessary to ask if fraud prevailed."

On the other hand, it must be admitted that in no small measure the prevalence of such abuses and alike the temptation to their perpetration were attributable to certain legislative enactments, notably the *Arrears Bill*. Thus in 1878 there was installed, "An Act to provide that all pensions on account of death or wounds received or disease contracted in the service of the United States during the late War of the Rebellion which have been granted or shall hereafter be granted shall commence from the date of death or discharge from the service of the United States." Who can measure the temptation here held out to soldiers or their dependents. It seemed nothing short of a bid for wholesale corruption, and in truth so it turned out. For, following the passage of the Act, the number of pensioners which, be it noted, had been steadily falling from 1873 (in five years the number had sunk by 15,000) underwent a notable increase. In six months after the installation 19,000 claimants found their way on to the Pension Roll, and within eighteen months the expenditure on pensions, which had dropped to 27 millions, soared up to 57 *million dollars*.

### The Responsibility of the Medical Profession

It is the duty of the medical man *to protect the State from imposition*—a responsibility hallowed by tradition. The dangers of laxity in this respect were fully appreciated by the Romans, and dismissal from their cohorts on account of age, infirmities, etc., was not lightly granted.

The Roman generals were fully alive to the fact that in the interests of efficiency and discipline great caution should be exercised in *proposing soldiers for discharge with a pension*. "For before it could be competent there behooved to proceed a solemn declaration of *physicians* that the person was utterly unfit for further service." Moreover, "If thereafter it was discovered that the dismission was obreptitiously procured the impetrant was ordained to be heavily fined."

In other words, the medical officer, while having due regard to the *claims of the soldier*, should be alive also to the *interests of the Services* upon the efficiency of which, as a defensive weapon,

the integrity of the Empire depends. It is the more necessary now, in that it is well recognized that malingering is more common in armies which have been *hastily recruited in circumstances unfavourable to progressive and complete discipline.*

The abuses that followed the Peninsular Wars—the prevalence of malingering—so impressed the authorities that by the Articles of War of 1830 any careless or fraudulent practice in this matter of *proposing soldiers for discharge* was heavily penalized.

"*Any officer who shall, by any false statement, certificate, or document, or omission of the true statement, attempt to obtain for any officer or soldier, or other person whatsoever, any pension, retirement, half-pay gratuity, sale of commission, exchange, transfer, or discharge, shall, on conviction thereof before a General Court Martial, be cashiered.*"—Rules and Articles, 1830, article 46.

To the credit of the medical profession be it affirmed that few, if any, instances have been recorded in which the *discharge of a soldier on pension* has been abetted by such practices. On the other hand, examples have occurred in which dishonourable surgeons lent their skilled aid to individuals to assist them to *evade military service* by the intentional production of *temporary or permanent disabilities.*

Naturally such offences have been more common in armies raised by *conscription*, and under the French Military Regulations military surgeons acting as accomplices are liable to imprisonment from two months to two years with a heavy fine. Moreover, it does not rest here, for these penalties are not allowed to interfere with those adjudged by the Penal Code under which the term of imprisonment may be extended from two to five years. These penalties, heavy as they are, but fit the gravity of the offence, for none will dispute that, if punishment is to be meted out to those who seek to deceive by the simulation of disease, the law ought not to be less severe on those who lend their assistance to the fraud.

### The Conditions of Discharge

A soldier is not to be discharged on account of *disability or infirmity* unless :

(1) *The existence thereof is satisfactorily ascertained; and*

(2) *The disability or infirmity is calculated to render a man permanently unfit for military service.*

In the recruiting of soldiers *aptitude* or "fitness for service" is the point to be investigated. Conversely in proposing him for discharge *inaptitude* or "unfitness for service" is what needs to be established. In the former case doubt as to "fitness"

justifies rejection, in the latter if "unfitness" is a matter of doubt, discharge should not be recommended.

### The Simulation of Disabilities or Infirmities

In the Army, as in civil life, Self-interest, "the ruling passion of mankind," is ever obtruding itself. To be in military subjection involves a measure of *self-discipline.* It is therefore but natural that ever and anon there will arise a feeling of revolt which—if unrestrained—engenders a *hankering after discharge.* To the man who has joined up "for the duration of the war" the restraints of his vocation may be irksome, but none but the foolish will deny that these same restraints are essential for military discipline. Nevertheless there are not wanting extenuating circumstances, which at any rate appeal to those "who do not wish the common feelings of a man to be lost in those of a mere disciplinarian." At home "on leave" he sees men in situations—not always his betters—rising to wealth and distinction around him, and contrasts his own prospects. Prospects of returning to the Front with the horrors of war still fresh upon him! Small wonder that for the moment his spirits fail, but all honour to him who, feeling thus, responds to the call! Often he hears the well-meant but ill-judged exclamation, "You have done your bit"; and who can measure its effect in fostering, nay suggesting, "Compromise where no compromise is"?

*The Evil Effect of too prolonged Sojourn in Hospital.*—As far back as 1727 Bland, in his "Military Discipline," made the following comment: "The least evil that can happen by soldiers remaining too long in hospital is that they will contract a slothful, lazy, idle habit, and turn, according to the military phrase, *malingerers* —that is, men who have lost all spirit to the Service, and feign themselves sick when there is a prospect of action, or that they are to undergo any great hardship or fatigue, in order to be sent to the hospital; which life, through habit, becomes agreeable to them."

Few will deny the general truth of Bland's observation that once admitted to hospital for some ailment the soldier—during his period of convalescence—is but too apt to become enamoured of the ease and comfort of the establishment and develops a disinclination to return to the ranks. His first intention may be simply to evade duty, but gradually he becomes more ambitious and his endeavours are centred upon *getting his discharge and if possible with a pension,* "on account of disability contracted on service."

### The Evil Effect of Suggestion

The soldier himself is by no means wholly to blame. Let us recall that both Continental and British authorities have emphasized the evil effect of misplaced or ill-advised sympathy in undermining the *morale* and sapping the virility of convalescent soldiers. In truth, the harmful influence exerted by well-intentioned but ignorant lay visitors—sentimental debauchees—cannot be overestimated. For the convalescent soldier needs not to be enervated, but rather energized, keyed up to the spirit of high endeavour.

> Stiffen the sinews, summon up the blood.
> *Henry V*

Under the *United States Pension Scheme*, the so-called "pension attorney" enrolled amongst his agents a number of *hospital visitors* who, masquerading as such, furthered his nefarious designs on sick and convalescent soldiers. Thus after the close of the Spanish-American War, we learn from the Report of the Commissioner of Pensions (1902) that in San Francisco "men and women were sent into the Presidio Hospital as visitors to the sick, under the guise of charity and various other pretexts, whose only purpose was to pour into the ears of such soldiers as they could glowing accounts of the system of pensions provided by law, and the merits of some particular attorney who made a business of prosecuting claims." To such a pitch did these pension attorneys and their accomplices carry their machinations that the commandant and surgeon of the Presidio Hospital were compelled to appoint a special examiner whose function it was to protect soldiers from these veritable harpies.

*Malingering not a Valid Reason for Discharge.*—Although a disposition to malinger is perhaps the most *disqualifying disability* a soldier may display, it is pre-eminently one to be checked, especially if it has for its motive the *gaining of discharge.* To grant such an evil-doer his discharge is but to pander to the end he has in view. Under the authority of Marshall we have it that many a crime has been perpetrated by soldiers for the avowed purpose of being brought before a court martial and ultimately discharged. Nor does the fact that when detected he is liable to be "discharged from the Army with every mark of ignominy and disgrace" serve as a deterrent in the more inveterate type of malingerer.

It is, of course, but natural that commanding officers should wish to purge the Army of men likely to exercise a bad influence upon their comrades. Moreover, they have good reason for wishing to obviate the risk of such moral contagion as the

following instances drawn from military as well as industrial circles clearly demonstrate.

## Epidemicity in Malingering

Marshall in his work narrates that during the year 1811:

> A greatly distended condition of the abdomen became in some measure epidemic among the men of the 84th Regiment then stationed in Dublin. From thirty to forty men belonging to that corps were admitted into the General Hospital, complaining of pain and distension of the abdomen, with excessive thirst; some of them drank daily more than a gallon of water. Dr. Harvey, who was physician to the hospital, eventually concluded that the symptoms were factitious, and under that impression he prescribed a solution of Glauber's salts, dissolved in weak solution of tobacco which he called the *Infusum Benedictum*. A cupful of this bitter mixture was given in the morning, and repeated every fourth hour until it operated, and with complete success; all the patients who were in hospital recovered speedily, and the disease soon disappeared. Sixteen men had, however, succeeded in *obtaining their discharge* before this method of treatment was adopted.

History repeats itself, for under the title "'Big Belly' in Soldiers," Desiré Denechau and Henry Mattrais (*Ann. de Méd.*, March–April 1917) cite instances the nature of which is reminiscent of the epidemic condition reported by Marshall. These authors, while they decline to believe the abdominal condition to be wholly due to simulation, feel compelled to admit that there is often "exaggeration." In other words, given a substratum of digestive troubles, an attempt is made to convince the doctor of the reality of these disturbances by *exaggerating the size of the abdomen*.

Again, Meriel (*Paris Méd.*, June 30, 1917) has remarked that cases of artificial *œdema of the limbs* have recently frequently presented themselves before medical boards, and moreover that on its basis *many men have been discharged as permanently unfit*.

Professor Attilio Ascarelli of Rome, discussing *self-inflicted injuries* among soldiers, observes that "each form of injury may assume an *epidemic, almost contagious*, aspect, so that one special lesion becomes predominant in a certain section of the troops, at first by the occurrence of a few cases which are often passed unrecognized, then by the rapid multiplication of similar cases, and their abrupt cessation when the similarity and abundance of examples render the fraud manifest."

M. Carruccio (*Polyclinico*, May 27, 1917) during the autumn of 1915 and the following winter observed more than a hundred soldiers with an *acute dermatosis* of practically identical nature. Some of the men confessed that the lesions were produced by the application to the skin of vegetable substances such as

pounded root of *Daphne gnidium* and the juice of the cactus leaf, which is very common in the gardens of the district.

Turning to the *industrial* sphere, we see the same tendency to epidemicity. Forgue and Jeanbrau cite the instance of a railway employee—engaged in the soldering of grease-kettles—who, having acquired *syphilis*, subsequently developed *mercurial gingivitis*. Having learnt that this affection resembled that seen in workers handling *lead salts*, he forthwith alleged that the condition of his gums was due to " plumbism "—the result of employment, and moreover on this account succeeded in obtaining *compensation*. A dozen of his fellow-workmen, learning of the success of his enterprise, were stimulated to emulation. Accordingly they rubbed their gums with mercury in the hope of achieving a like fraud. Fortunately the doctors concerned, being puzzled by the epidemic, instituted inquiries and unravelled the plot. On dismissal of the implicated workmen the epidemic immediately ceased.

Instances of such " *epidemic* " *outbreaks of malingering* might be multiplied, but the above examples will suffice to show the truth of the old saying that " Evil communications corrupt good manners." Despite this possibility of contamination it would, however, appear to be unwise policy to punish malingering by *discharging the offender*. To do so is to encourage vice rather than to promote discipline. Moreover, as Marshall pointedly remarks, it is clearly not the doctor's function to further the malingerer's project by assigning as a reason for discharging him *some possible or imaginary* physical infirmity when the true reason for wishing him to be discharged is his unwillingness to do his duty.

### *The Functions of the Expert*

The medical man stands as mediator betwixt the State and the soldier. The latter looks to him for intelligent and sympathetic appraisement, while the former with equal justice looks to him for protection from imposition. His findings constitute the core of the assessment. Upon his fiat the State bases the measure of its indebtedness to the soldier. No sinecure in truth ! The claimant may or may not be affirming the truth, but obviously his mere assertion cannot of itself be accepted as evidence of his *bona fides*. Conversely, the medical man should not dismiss an alleged disability as imaginary or simulated until he has subjected the victim thereof to careful examination.

### *Attitude of Expert*

He must approach all cases with an *unbiassed and impartial mind.* Rigid neutrality is essential if he is to draw sound conclusions as to the presence or absence of disease, the existence or not of imposture. He must be neither *ultra-sceptical* nor *too credulous.* For while the former sees malingerers everywhere, the latter is too often "deluded by a seeming excellence." Of the twain let him err on the side of credulity, for it is better that the guilty escape than the innocent suffer.

The soldier up for a pension is a *patient* until he is proved a malingerer—a point that needs emphasis. The expert's rôle is not to extort a confession of malingering, but to *demonstrate the existence of simulation.*

Too often a brusque frankly suspicious attitude is assumed which is not only unjustifiable, but foolish. For if we believe a man to be malingering, the last thing we should do is to give him an inkling. For *unsuspecting that he is suspected,* he is the more likely to drop into contradiction, to make statements incompatible with the rest of his story or with known clinical facts, or at variance with established proofs drawn from other sources.

Again, while attaching signal importance to the objective signs of disease, he should not hold in derision all *subjective* complaints. He must recognize the extreme ease with which simulation can be confused with genuine nerve disease—especially *hysteria* or other disorders of *psychogenic* origin. Moreover, if, like a hectoring counsel, he assumes terrific tones and deportment, he will certainly evoke what has been termed the "simulation of reaction." In other words, by his lack of sympathy he imbues the soldier with the conviction that his claims to a pension are in danger of being completely ignored. Obsessed with this fear of injustice, he—in sheer self-defence—feels driven to exaggerate his disabilities, though he came prepared to be quite sincere.

Fortunately, as Bhose in his "Juristic Psychology" observes: "The number of cool steady liars who can spontaneously move from lie to lie without any emotional manifestation, who can act and behave like truthful and honest witnesses while pouring out falsehood, are not to be met very frequently." Continuing, Bhose recalls Mr. Plowden's advice to any one in doubt as to whether a witness was speaking the truth: "Watch his hands and his mouth. The mouth is perhaps the most expressive feature and the hands are seldom at rest."

The medical man, too, would be well advised if he recalled

that "Even more is to be learned when he has given evidence and sits in Court unsuspecting that he is being watched." The expressions that pass over his face are often very instructive, and it has been observed that "A witness who is swearing to a well-cut lie will, while doing so, throw back his head with an indifferent air and close his eyes or blink." Here, too, it may be added that Indian judges are wont to watch the *feet*—often restless when face and hands are under control.

In drawing to a close our discussion of the attitude and function of the medical expert, we would emphasize the fact that he should be familiar not only with the natural physiognomy of disease, but with its *aberrant* forms. No amount of natural sagacity or intuitive wisdom will compensate for professional ignorance. To overlook existing disease is deplorable, but to go further—to affirm rashly that its manifestations are *simulated*—is to add insult to injury.

## Definition and Class of Diseases generally Simulated

"To pretend illness, to produce or protract disease—*is said especially of soldiers*," thus runs the definition in the Oxford Dictionary. The last four words are a gratuitous and unjustifiable insult when the flower of English manhood has perished for an ideal! * Moreover, the definition needs amendment, for as now used the term "malingering" comprehends not only (1) the pretence, provocation, or protraction of disease; but also (2) its exaggeration when existing; (3) its intentional concealment when present; (4) its false imputation when real or feigned, to some factor not in ætiological relation thereto.

Malingerers feign *symptoms*, not diseases—preferably those of *subjective* character, e.g. neuralgias, sciatica, pain in the back, giddiness, etc. Diseases calling for *passivity* and *perseverance*—deafness, blindness, imbecility—rather than those that demand *unceasing vigilance*—paralysis, contractures, mania. But despite their predilection for subjective or nerve troubles, their fraudulent activities are not restricted to this sphere. For day by day, with increasing knowledge, malingerers display increasing resourcefulness.

## Types of Malingering

All forms of fraud relating to matters of health fall under the heading of—(1) pure malingering; (2) partial malingering or exaggeration; or (3) false imputation.

* *Vide* "Malingering," p. 53—"Malingering not more common in soldiers than civilians."

*Pure Malingering.*—Here are comprised all examples of *deliberate* and *designed feigning of disease or disability*, i.e. disease or disability which is *non-existent*, or if it exists, has been artificially provoked, and also existing diseases intentionally concealed.

Thus, it may be a matter merely of *false allegation*—viz. a healthy soldier may falsely assert that he is the victim of pain, vomiting, and so forth. Or he may simulate *objective* phenomena —viz. lameness, tremor, contracture, paralysis. If still more vicious he may resort to *automutilation* or actually *provoke* symptoms or lesions by artificial means—viz. by inserting foreign bodies into nose, ear, or eye, and in this way a *rhinitis*, *otorrhœa*, or *conjunctivitis* is initiated.

*Further Examples of Feigned Disorders.*—Loss of strength has been caused by the ingestion of *arsenious acid*, *lead*, or *mercury* —or, to the same end, *vinegar* in large amounts consumed. *Gastric* disturbance has been produced by the ingestion of a mixture of oil and tobacco; *jaundice* by smoking a mixture of antipyrin and tobacco, or by the subject's dosing himself for prolonged periods with small doses of *picric acid*. The phenomena of *dysentery* have been feigned by diluting fæces with urine, and adding pig's fat or raw meat thereto.

*Cardiac* and pulmonary disorders have proved a fertile field for the simulator. Thus cardiac irritability has been excited by excessive smoking, swallowing of nicotine or cordite, while some have not hesitated to resort to *digitalis* or the *hypodermic injection of atropine*.

*Hæmoptysis*, as Pollock remarks, is one of the conditions most commonly induced artificially by soldiers. The buccal mucosa is pricked with a pin, and the blood mixed with the saliva, and then expectorated with a cough. Various *colouring-matters* have been added to the sputum, while some have resorted to the disgusting expedient of swallowing animal blood and ejecting the same.

*Albuminuria* and *œdema* have been produced by taking large quantities of common salt in milk for some days. "Trench nephritis" has been simulated by adding *egg-albumin* to the urine, and associated œdema by constriction of the limbs. Moreover, egg-albumin has been added to voided urine and the same injected into the bladder by catheter. *Grape* and *cane sugar* have been utilized in the same manner to simulate *diabetes*.

*Mirabile dictu*, *auto-inoculation* with *gonorrhœal* or *syphilitic* discharge has also been perpetrated. The most varied *skin lesions* have been excited by the application of chemical or vegetable irritants, and epidemic outbreaks of *otitis* and *conjunctivitis*

have been traced to the use of artificial irritants. The so-called "hard œdema" of the hands has been produced by mechanical means; and in the lower extremities a condition resembling elephantiasis has been similarly provoked. Subcutaneous *abscesses* have been excited by the hypodermic injection of fæces, urine, petrol, vegetable juices, etc.

The exigencies of space preclude us from an exhaustive résumé of the various methods of fraud adopted by the present-day malingerer, whose ingenuity and finesse steadily progress with the advance and diffusion of knowledge. Indeed, there is not wanting evidence to prove that the *art of malingering is becoming systematized*, and there is little doubt that some individuals with pretensions to scientific knowledge have not scrupled to prostitute their talents to the end of aiding and abetting these nefarious practices.

*Partial Malingering or Exaggeration.*—If pure simulation of disease by a healthy individual is rare (according to German experts, 2 per cent.), false statements as to the intensity of an existing disorder or disability are but too common. Now if it be incumbent on the expert to see that the pure simulator does not obtain discharge with a pension, he must have regard to the following far more common possibility: Given that a soldier—the victim of genuine disease or disability—has been placed on temporary pension, he may, prior to such becoming fixed as *permanent*, be guilty of fraudulent exaggeration under one or other of the following guises.

Apart from the fact that the pensioned soldier may *consciously and intentionally exaggerate the symptoms of real disease*, he may go further, and deliberately *superimpose factitious symptoms or signs upon a substratum of real disease.* Thus, if the victim of chronic bronchitis, the sequel of military hardship, he may add blood to his sputum so as to suggest tuberculosis.*

Perhaps the most subtle type of fraud in this particular sphere is that recorded by MacWalter. He noted certain instances of continued illness suggestive of *tuberculosis*, but in which no physical signs in the lungs could be detected. Nevertheless the sputa contained *acid-fast* and *Gram-positive bacilli.* Subjected to espionage, one of the said patients was seen to mix his sputum with *preputial secretion.* When it is recalled that the *smegma bacillus* closely resembles the organism of *tubercle*, not only in size and shape, but also in being acid-fast and Gram-

* We know of an instance in which a soldier—the subject of pyorrhœa—added blood obtained from his gums to his urine. For several months he was regarded as suffering from hæmaturia, but eventually, being taxed, he admitted to fraud.

positive, it will be seen how easily tuberculosis may be erroneously diagnosed. The fact, too, that the smegma bacillus occurs on the skin and also, it is stated, in the ear, on the tongue and teeth, in the sebaceous secretion, and perhaps in the sputa, shows the necessity of not only the most careful physical examination, but the most vigilant supervision of all cases of doubtful nature.

We are acquainted also with an instance in which a soldier, the subject of a *perforating wound of the lung*, was captured by the enemy. Placed in hospital, it so happened that the adjoining bed contained a soldier suffering from *tuberculosis*. With a pardonable wish for repatriation, the former added some of the tuberculous sputum to his own expectoration. His sputum being then examined, it was thought that tuberculosis had supervened secondarily to his pulmonary lesion. He attained his wish —repatriation—and on returning to his native country was re-examined. His sputum was then found to contain *pneumococci* in pure culture, but *no tubercle bacilli*.

Again, the soldier or pensioner may intentionally *aggravate* or *protract* the course or duration of a disease or injury. The victim of *dysentery* may—with intent to deceive—eat indigestible articles of food, or add blood to his fæces. In like manner the *diabetic* may take excess of carbohydrates or dose himself with phloridzin. The subject of a *fractured limb* may, to retard union, tamper with his splints; while he with a stiff shoulder may refrain from the exercise necessary for its recovery. In like manner the individual with a *synovitis* of the knee may—to secure aggravation of the same—have recourse to mechanical agencies. To this end French soldiers have been known to insert a potato in the ham. To retain it *in situ* the limb is forcibly flexed and secured in this position by bandages. In this fashion after a few hours a *hydrarthrosis* is produced.

Lastly, we have to consider those cases in which there is exaggeration *through deficient powers of subjective analysis*. Under this heading come the subjects of *traumatic neuroses*, who—often of a neuropathic cast—are pre-eminently "suggestible." Generally speaking, they should not be classed as *malingerers*—a pitfall dropped into not only by the laity, but also by the medical man.

Thus, we should not in the case of a victim of *shell-shock* conclude that he is a *malingerer* on the ground that, following the assurance that he will not be sent back to the Front, he undergoes rapid amelioration.

In the psychoneuroses of war we must recollect that the subjects are very sensitive to *suggestion*, and also that their

exaggerated statements are but a *morbid* symptom. In short, as Brouardel states: "The injured exaggerates in good faith—I should say exaggerates to himself the gravity of his state."

Still, despite these reservations, it is possible that states of *mutism* following *shell-shock*, etc., are in some instances consciously and intentionally persisted in to the intent of evading further service. From observation of some cases, authorities of repute have felt impelled to conclude that the mutism was relinquished as soon as all necessity for its persistence had passed.

## False Imputation

This consists in the *attribution to a definite cause of morbid phenomena or symptoms recognized or ascertained to be œtiologically unrelated thereto.* Our discussion of the intricate questions that arise under this heading will be referred to a subsequent chapter, in which we hope to deal in detail with that often obscure problem —viz. *Is or is not the disorder or disability due to or aggravated by military service?*

### *Detection of the Malingerer*

Not only before, but *after* discharge is it necessary that we should be alive to the possibility of malingering. For by Article 9 of the Pension Warrant a soldier is *eligible for pension even when disablement takes effect after discharge.* Nor is this all, for a further loophole for abuse resides in the fact that those in receipt of either a *temporary* or a *permanent* pension may resort to fraudulent practices to ensure continuance or increase of their monetary allowance.

With the modes of detection of all forms of fraud relating to health we shall deal shortly. But here we must recall that in the case of *pensioners* this additional duty is imposed upon the medical man—viz. of establishing whether or no the pensioner is or is not the individual he claims to be.

### *Identification of Claimant*

Not only pensioners, but other persons may knowingly *personate* or *falsely assume* the name or character of a soldier who is or may become entitled to a pension. Or the same may falsely pretend to be the *heir, administrator, or assignee* of a pensioner or soldier for the purpose of fraudulently obtaining money or effects.

In Act 7 Geo. IV, cap. 16, clause 38 (1826), it is laid down that if legally convicted of such fraudulent personation, the individual was liable to be transported as a felon. The necessity

of guarding against such felonious practices is still realized by the Ministry of Pensions. For in the case of claimants for a further grant of pension, it is requested that—to *prevent personation*—the medical officer shall identify the pensioner before investigating his bodily condition.

This, the Pension Authorities observe, "can usually be done by comparison of signature, personal description, or marks on body. In cases of doubt, questions should be asked based on the records of service, the answers to which would not be known to a personator, such as the nature of illness mentioned in the medical history sheet, or offences in the defaulters' sheets, etc., for which purpose the whole of his discharge documents are annexed."

The French Pension Authorities—for the purpose of identification—check the authenticity of the claimant's signature by the system of "finger-prints"—the index and middle digits of the right hand, or those of the left if the right are lacking. Its usefulness need not be insisted upon in instances in which the claimant is unable to affix his signature.*

A recent writer, discussing abuses under the American Pension Scheme, observes: "Personation of old soldiers was a common practice; thousands of veterans went peacefully to their graves not knowing that their names were on the Pension Rolls, other men—in some cases pension attorneys—drawing and pocketing the quarterly cheques."

It is on record that cases occurred in which one man had drawn several pensions, others in which two and even three persons had drawn pensions for one man's service, and, lastly, *mirabile dictu*, instances in which pensions have been continued long after the rightful beneficiaries have gone the way of all flesh!

The identity of the claimant having been satisfactorily established we may proceed to the more purely medical aspects of our difficult task. This cannot be better prefaced than by the following passage culled from Cheyne's work on the "Feigned Diseases of Soldiers": "The wiles of soldiers in hospital will be with more certainty discovered by those who have an accurate knowledge of disease obtained by clinical observation and pathological writings of authority than by those possessing natural sagacity in the highest degree, if unassisted by a habit of carefully contemplating and studying disease." These words of caution are indeed called for, for the

* In the United States an armless man, having committed some misdemeanour in a place where he was unknown, was identified by means of his *toe-prints*, a tracing of which had been officially recorded.

detection of malingering is the *ne plus ultra* of differential diagnosis.

## Method of Investigation

*Malingering and true disease may co-exist*, and either through lack of knowledge, or too cursory examination, the associated morbid condition may be overlooked. In short, our first step should be a searching clinical examination along authorized lines to establish the presence or absence of *organic* disease. During this procedure we should have a keen eye to the clinical vagaries of the malingerer—*never better observed than when he thinks himself unobserved.* Direct observation is good, but indirect better, for the subject is, as it were, off his guard. Discrepancies in speech and conduct often give the immediate clue. The special pitfall of the malingerer is *exaggeration*, and, next to this, *ignorance*; and while the physician notes the former, he may take advantage of the latter.

*Pain* is his commonest plaint, and always intense it is always *vague, incapable of localization,* and *rebellious to all treatment.* In his ignorance, too, he often affects symptoms alien to the disease he seeks to imitate. Again, he usually forgets that genuine disease—if long continued—leaves its mark on *general nutrition*, while local disorders, too, rarely lack *objective* evidence of their presence. Alleging severe disease of the internal organs, his rude health gives him the lie, even as the plump muscles of his alleged " stiff joint " tell their own tale.

Presupposing that *organic* disease has been excluded we are still far from being justified in assuming simulation, for we still have the further duty of excluding the possibility of the symptoms being of *psychogenic* or *hysterical* origin. If such can be ruled out of court, and malingering seems probable, but not certain, then, and then only, are we at liberty to resort to *direct tests for simulation.* While inhuman methods of detection are not permissible, the circumvention of the malingerer by strategic ruses is justifiable. This may be achieved by *suggestion* or " the method of surprise," or haply the judicious use of irony, ridicule, or satire. If these fail, we may resort to tests which have for their object—(1) the misleading of the malingerer; (2) the distraction of his attention; (3) the induction of a state of bewilderment, etc.

*Method of Misleading.*—In this procedure we seek either (1) to evoke the *unconscious or unwitting* achievement of bodily actions previously disavowed, or (2) to deceive the unsuspecting person as to the conditions obtaining during the examination. For example, in alleged paralysis of the arm, the physician—

bidding the subject close his eyes—raises the assumed powerless limb passively to the vertical. This attained he relinquishes his hold and bids the patient lower his arm *slowly* and *gently*. If he succeed in doing this so slowly that the pull of gravity is only capable of *gradually* asserting its influence, *simulation* is proved.

In alleged unilateral blindness or deafness one seeks to hoodwink the subject as to which eye or ear is for the moment as it were in action. Outwitted in this way the malingerer may unwittingly see with the alleged blind eye, hear with the alleged deaf ear.

*Distraction of Attention.*—The astute malingerer realizes that for him to win, his attention must be concentrated. The object of the expert then is to divert his attention. The following procedure may be adopted in *alleged paralysis of the lower limb.* The subject asserts that he cannot raise the limb from the bed. The physician then passively flexes the thigh, retaining it in this position by placing his hand beneath the ham. To distract attention he simultaneously with the other hand grips the ankle and bids the subject flex and extend this joint against resistance. Now while this is being done *the hand beneath the ham* is gently and unobtrusively removed and it may happen that the limb is seen to *remain in situ.*

*Induction of Bewilderment.*—Here we seek to confound the subject—to confront him with *three or four alternatives*, and so upset the preadjustment of his bodily sense organs to oncoming impressions. The stereoscopic apparatus devised by Burchardt is specially designed to produce a state of *mental confusion*, and is invaluable as an aid to the detection of *simulated unilateral blindness.* Similarly, in *simulated unilateral deafness* Teuber's method of inducing mental bewilderment is well known, and elsewhere we have recounted in detail the technique of these tests.*

*The Method of taking Advantage of the Subject's Ignorance or his Limited Capacity for Observation.*—To prove the *bona fides* of a man who alleges muscular paresis, we may utilize his ignorance of the scientific fact that *contraction of a voluntary muscle is associated with relaxation of its antagonists.* Thus in alleged weakness of the *flexor muscles of the elbow* the following ruse may be invoked. The subject is asked to flex his elbow as strongly as possible. If simultaneously the *triceps* is felt to be firmly contracted, we know that he is attempting to mislead us as to the degree of his flexor weakness ; in short, there is intent to deceive.

* "Malingering, or the Simulation of Disease."

Again, in attempting to appraise the verity of any statement as to pain or tenderness in a given area, we may take advantage of the principle underlying *Weber's law of sensation*—viz. that the two points of a compass are only perceptible as distinct stimuli when situated at a certain distance apart—in the lumbar region more than two inches. Applying the test the individual is asked to indicate precisely the site of a tender spot or area of anæsthesia and this at first with his eyes open. The physician then locates the site with a coloured pencil. Subsequently when blindfolded he is again asked to point out the alleged area of pain or loss of sensation. This second localization is again pencilled out, and if the subject is a malingerer, one will almost certainly find *freedom from tenderness* within the previously alleged painful area or evidence of sensory perception within the previously alleged insensitive area.

Endless variations of these methods of detection are of course available, but our intention here has only been to point out the *general principles* on which are based the various direct tests for simulation, and for greater detail we must refer the reader to our work on "Malingering." No remarks, however meagre, on this difficult subject would be complete did we not emphasize the value of *periodic* and *unexpected visits* in unveiling the more crafty types of impostor.

The last resort of the expert in suspected cases which have defied all other methods at unmasking imposition is that of *constant observation*. Often, though there be strong presumptive evidence that no material disease exists, nothing but the closest observation, isolation, or constant and long surveillance —favoured by concurring circumstances—will enable us to obtain *formal proof of imposition*.

Finally, the doctor must take heed that his charge of malingering is not founded on *incomplete examination, imperfect observation*, or *hasty inference*. He must beware of falling a victim to certain fallacies usually attributable to inadequate knowledge of the resources or, equally important, the limitations that still beset the art of Medicine.

How easily may a man not familiar with the *neuroses* be misled by their infinite variety, their *fleeting* or *periodic* incidence. He should never forget that *unfamiliar, bizarre*, or *paradoxical* symptoms are not necessarily proof of simulation. Many other pitfalls, too, await the incautious medical man, but in the short space at our disposal it is impossible to do more than issue a *caveat* against rash or ill-founded conclusions. Assuming that the *reality of the alleged disability or infirmity* is established, we have now to approach the second question.

## Does the Disability or Infirmity render the Man Unfit for Military Duty?

The disabilities which may unfit soldiers for military duty scarcely admit of accurate definition, much less specific enumeration. For there is hardly any infirmity or disability, however trivial in its general character, which may not exist in so severe a degree as to impair the efficiency of the soldier.

Obviously it may be affirmed that certain conditions, when definitely determined, such as pulmonary tubercle, malignant disease, advanced cardiac disorder, etc., forthwith predicate exemption from service.*

Apart from these and similar grave disorders or lesions, the estimation of the sick or disabled soldier's capacity for duty is often a matter of the utmost difficulty to decide. Clearly, any one competent to make such a decision must not only be equipped with professional knowledge, but also acquainted with the duties of soldiers and what is required of them.

The *mere absence of objective changes* cannot of itself be held an absolute criterion of a man's fitness for military duty. It must be recognized that *neurotic* subjects—even those presenting no *objective* phenomena—may yet through giddiness, pains, etc., be wholly incapacitated for duty. On the other hand, those who exhibit objective abnormalities may yet, militarily speaking, be efficient. This especially having regard to the very varied requirements, the diverse vocations, that are necessary for the upkeep and maintenance of modern armies.

To sum up, individuals present the widest divergence in respect of their fitness for military service as measured by the *objective* signs they present. So much so is this the case that hard and fast rules cannot be formulated on this basis. As an old military surgeon out of the fullness of experience remarks on this subject: "There are many degrees of loss of vision, varicose veins, hernia, rheumatic pains, lameness from old fractures, mutilations, etc., which do not disqualify a soldier for performing his duty, and which would be little heard of by a medical officer provided a soldier wishes to serve and has an object to gain by doing so."

It is in the sphere of the *neuroses* that the question for capacity for military service most frequently comes up for decision. Often, too, the nerve symptoms on which the alleged disability

* Recently the Under-Secretary for War in the House of Commons, in reference to troops serving in East Africa, observed: "It is not considered necessary to discharge men who have suffered from malaria and dysentery, as after recovery they can still be employed on service."

is based make their appearance precisely at the moment the soldier resumes duty.

To infer off-hand from this coincidence that the soldier is *malingering* is to expose oneself to the possibility of grave error. For on reflection it is clear that the moment of resumption is precisely the moment of *strain*—the one thing calculated to disclose the latent weakness. Exaggeration in these subjects is extremely common—either due to genuine overestimation of their troubles, or maybe through design. The latter, i.e. attempt at imposition, would be suggested if there be *gross disproportion between the subjective symptoms and the objective findings.*

In proposing such subjects for discharge with pension, we should thoroughly realize the *therapeutic value of discipline and employment.* In the Austrian Army hysterical soldiers are frequently sent back on duty with often the happiest results. We should therefore be inclined to *under-* rather than over-estimate the degree of the claimant's alleged disability, and should on no account hint that there is any likelihood of his incapacity being *permanent.* Here, of course, we refer to the slighter or more moderate types of neuroses, for it is clear that in the more severe forms, those presenting local *objective* signs—cyanosis, etc., or symptoms pointing to psychosis—are quite unfit for military service.

In affections of the *special sense organs* it is of course desirable that the opinion of a specialist be obtained before any decision is arrived at. Particularly is this necessary in regard to *errors of refraction.* For according to modern regulations a moderate degree of ametropia—if capable of correction by glasses—does not constitute a bar to service.

Again, *loss of an eye,* though if imputable to military service predicates a pension, does not necessarily entail immediate discharge, the lesion being compatible with retention in the Service, though possibly in a different arm thereof.

In regard of *traumatic* lesions, our decisions should not be wholly guided by the objective state, but by the degree of persistent *functional* impairment. A fractured leg, even though deformed or slightly shortened, may yet be perfectly serviceable. In the upper limb, a lesion of the right arm in a right-handed man, while it may disqualify him for the firing-line, need not necessarily debar him from auxiliary branches of the Service.

Lastly, it need hardly be said that the soldier suffering from any disorder which imperils the *safety of his comrades* should forthwith be withdrawn from the Service. But apart from this we should exercise the greatest caution in proposing a soldier for discharge ; as doubtless in our own as in other armies—at the

onset of hostilities—discharge from the Service was too easily procured. Still, in extenuation it may be said that only little by little with increasing experience have we become enabled to define the disabilities or infirmities that *are or are not compatible with active service.*

## Is the Disease or Disability Incurable, and will it Permanently Unfit the Man for Military Duty ?

Here in a very special sense the medical officer finds most scope for error, the greatest field for sound judgment. It cannot be too strongly enforced that his office demands of him deliberation and a calculation of consequences. The groundwork of his decision will be the interpretation of the facts discovered by him during examination. This constitutes the basis on which he is enabled to formulate an opinion as to the *curability* or *incurability* of the lesion or disorder in question. He must be familiar with the *mode of evolution* of pathological processes, whether of *traumatic* or *non-traumatic* origin.

For him the art of *prognosis* takes on a special significance. His estimation of the end-results of treatment is of paramount importance both to the State and to the soldier under review. He must be able to form an impartial reasoned opinion as to the prospects of treatment—the likelihood or not of permanent cure or partial relief being secured.

In short, he has, so to speak, to cast the clinical horoscope of the subject—to arrive at an accurate forecast of what will most probably be the terminal condition after all resources of treatment have been exhausted. He should therefore be most careful not to rush to rash conclusions as to the *incurability* of a lesion or disorder.

If it be a question of *mutilation* or *irremediable lesion* its *incurability* may forthwith be assumed. It is otherwise in the vast majority of morbid lesions or disorders. Here no hint at incurability should be rashly expressed until all the resources of therapy have been exhausted.

Nor should we overlook the fact that nothing is more likely to arouse the suspicion or mistrust of the soldier than glaring discrepancies between the opinions expressed by different medical men as to the severity of his injury and its ultimate course.

Experience over and again shows that a degree of recovery far exceeding that entertained in the first instance oftentimes ensues. We should therefore in the initial stages of an injury carefully avoid all unguarded comments as to its ultimate bearing on the soldier's fitness for service. Incautious statements of this

nature are hoarded up and dwelt upon by the victim. His hopes of a discharge with pension are stimulated, and with the passage of time he is only too likely to develop an exaggerated view as to the severity of his disability. Moreover, when, as fortunately happens in many instances, absolute cure or marked amelioration ensues and he comes up for reassessment, he is apt to consider himself unjustly treated if his pension is withdrawn or falls short of his expectations.

## CHAPTER VIII

## ORIGIN OF THE DISABILITY OR INFIRMITY

" 21. (a) *State whether the disability is clearly attributable to:*

" (i) *Service during the present war;*

" (ii) *Climate;*

" (iii) *Ordinary military service;*

" (iv) *Want of proper care on the man's part, e.g. intemperance, misconduct, etc.; or*

" (v) *Whether it is constitutional or hereditary.*

" (b) *If due to one of the first three of these causes, to what specific conditions do the Board attribute it?* "—Army Form B. 179.

### General Considerations

Even as the worker in the industrial hive—if he seek compensation for damages sustained through " accident "—must establish his suit, so in like manner the soldier—to justify his right to pension—has to fulfil the " conditions of claim " as laid down in the Royal Warrant.

To the initiated—the surgeon versed in the ways of Courts—a mere glance at the questions involved—the issues at stake—suffices! For he—better than most—realizes the obscurity that but too often enshrouds the *ætiology* of disease or disability. Taxed by a hectoring counsel how often has he had to lament that " medicine is far from being an exact science," to admit not seldom that ætiological diagnosis is " little better than a guess enlightened by experience." But too true, for in no sphere of medical knowledge are there so many gaps as in ætiology, so many pitfalls for self-entanglement through imprudent or incautious statements. Elusive as are the ultimate origins of disease, what of the " blind labyrinths and crooked turnings of human composition! " For, even as the industrial worker—to gain compensation—may falsely impute to recent accident his ancient hernia, so also—stimulated by the hope of a pension—the soldier sometimes resorts to similar modes of imposition.

Even at this stage of the war it becomes clear that the attribution to " military service " of *unrelated* or *pre-existing* disease or

infirmity is a form of fraud at once most easily resorted to and most difficult of detection.

The serious nature of the offence is clear when we reflect that even as in civil life an "industrial accident" *ipso facto* constitutes a basis for compensation, so also does an "accident of war" open the right to pension. Consequently the soldier who makes a false allegation as to the origin of a disability or infirmity is guilty of a breach, not only of moral but also of military law—in short, of "actionable misrepresentation."

In light of these possibilities of fraud an added gravity pertains to the soldier's hospital record—his medical *dossier*—which is hereby invested with *medico-legal* significance. For it is upon the data contained therein as to the *circumstances of origin* of his disease or disability—supplemented by the evidence of military documents, and, in certain cases, that derived from a prescribed Court of Inquiry—that we are enabled to decide as to the validity of his claim to pension.

So much by way of prelude, but before proceeding to detail the steps necessary for verification of the origin of a disability, it will, we think, be desirable to discuss certain other related issues.

### *The Term "Military Service"*

To establish a right to pension there must be *personal injury* through "military service"—in other words, an "accident of war." It is the purpose of the investigation to establish the fact. Now from the character of the questions asked, it is clear that the term "accident of war" is susceptible of very wide interpretation. Time was when the term "traumatic" was restricted to injuries, the result of *physical* violence. But we now recognize that for clinical purposes such limited interpretation is unsatisfactory in that it takes no count of *psychical* influence—viz. mental traumata. Still, even if the term "traumatic" be taken as including physical violence and psychic shock of extrinsic origin, it yet remains, according to modern views, inadequate. For we cannot sharply differentiate between those disorders which develop as a result of *sudden* physical or psychic injuries and those which owe their inception to causes operating *more tardily*. Or for that matter from those disorders the clinical manifestations of which—although they may appear abruptly—are the outcome of insidious though noxious factors that have been for a long time operative. We see, therefore, that the term "traumatic" in its modern and more extended meaning includes any detriment to health which originates outside the body. In other words, *any personal injury*

*sustained under circumstances which can be referred to as an "accident of war."*

So extended is the zone of modern warfare that the need of a more liberal interpretation of the term "military service" is obvious. *Pari passu*, too, the liabilities of the State in this connexion undergo expansion. Thus, owing to the increased range of modern gunfire and the nigh limitless scope of aerial warfare, the soldier, even when "off duty," is still exposed to the dangers of "military service." If detailed off to assist in tillage of the soil he is in the eyes of French military law held to be executing "military duty."

To sum up, it is clear that in modern warfare the soldier—compelled to live within a certain zone—is exposed to unforeseen and sudden contingencies of extrinsic origin (stray shell, an aerial bomb, etc.), and such, when they entail personal injury, will prima facie constitute an "accident of war." Moreover, if such casualty occur through no fault of the soldier—disobedience of orders, etc.—his right to a pension should be recognized.

Albeit, if wide, the responsibilities of the State are finite, and elastic as may be the term "military service" it has limits. In other words, the responsibility of the State being engaged, it must be established whether the disability or infirmity was sustained in or during the course of "military duty," or whether it was the result of causes outside the scope of the soldier's authorized service. Under this latter category would come those cases—formerly not uncommon—in which a soldier either through design, negligence, or drunkenness is maimed by the discharge of his own rifle, or by other means, and thereby becomes unfit for service.*

Fortunately to define what is or is not an "accident of war" is not demanded of the medical officer, whose duty is rather to establish whether the disability is the consequence of the alleged casualty and whether the resultant lesions are compatible with the cause invoked.

## Verification of the Origin of the Disability

The call for searching study of these cases, which are not seldom obscure and in which for *medico-legal* reasons accurate

* Duco and Blum cite several instances in illustration of this point. Thus, a soldier sustained a wound through his own carelessness in handling a grenade or in detaching an unexploded fuse. Another, despite formal orders to the contrary, alighted on the wrong side of the train and suffered injury through a train travelling in the opposite direction. Yet again, a third individual not only without having received orders, but against orders, was thrown off a horse which he had no business to mount.

*ætiological* diagnosis is especially essential, needs no emphasis. Obscure, often of necessity, for the *milieu* of the modern battlefield scarcely admits of calm detached observation of how each particular combatant met with this or the other casualty. How seldom, in civil life, in great catastrophes, railway collisions, etc., is a clear account forthcoming of *how* the injury, in particular instances, was sustained! In the shock of battle strife, as here, there are no spectators—all participants rather than *witnesses*. The tragic horrors of the scene may well unman the stoutest, and scarce can we wonder that the victim himself, even if conscious, fails of an intelligent account of how his injury was sustained.

Despite the difficulties, however, we have to, if possible, establish a chain of causation, and it is to the soldier's *medical dossier* that we turn for the data on which to formulate our opinion as to the origin of his disability. It is by means of the evidence contained therein that we are able to link up cause and effect—the casualty, or maybe the event or circumstances—and the alleged consequences.*

Obviously all the information embodied in the field medical card and Army Form B. 178 should be subjected to careful analysis by the medical board. Definite and reliable information concerning the *circumstances* of the casualty is of course most likely to be gleaned in the earlier records—those from the zone of fire. Such, when it is obtainable, is of most valuable import, for the nature of the casualty determines largely the character of the resultant injury. But though in most cases this generalization holds good it should not, in considering individual instances, be relied on too implicitly. For although usually certain causes lead to similar results, a variation in the conditions obtaining may bring about exceptions.

Now while accurate though necessarily succinct information concerning the circumstances of the casualty may be forthcoming from the earliest records, such, for reasons referred to, is often lacking. In such event, therefore, the question of the origin will have to be decided upon the data furnished from the records of the base hospital (Army Form W. 3083), supplemented by the information derived from the home hospital (Army Form I. 1237), the soldier's conduct sheet (Army Form B. 120), his active service casualty form (A.F.), his A.F.B. 117 (in case of wounds whether self-inflicted, the result of accident, or due to negligence), his medical history sheet (Army Form B. 178), and the findings of the medical board (Army Form B. 179).* In

* In assigning the cause of a disability we should establish whether it is (*a*) caused or aggravated by service in the present war, (*b*) due to causes not connected with the present war, viz. (1) earlier active service, (2) climatic disease

cases of trench feet we should not omit to examine the official data as to its genesis—viz. *is it due to negligence* ?

In addition we have in certain cases the further aid afforded by the findings of a *Court of Inquiry* when such has been instituted.* Likewise also we have the evidence forthcoming from the reports of special experts, the revelations afforded by skiagraphy, etc.

These official documents will furnish data as to the date of the casualty, the locality in which it was sustained, also the nature of the projectile, the site of the initial wound, and the tissues implicated; while in addition will be found therein the later *complications*, if any, and the character of the *operations* performed. It is to these records also that we have to turn for information as to the origin, not only of disabilities, but also of *infirmities* attributed to "military service." It is in these cases more particularly that we experience most difficulty in linking up cause and effect—the fatigues and obligations of "military service"—and the existing malady. Especially so in the sphere of *nervous disorders*, in which frequently the alleged exciting cause, though not productive of *immediate* consequences, has been the alleged starting-point of a more or less serious nerve affection.

The immediate results of *physical* injury can usually be interpreted at their true value, but their *ultimate* consequences are often most difficult to gauge. But even so they pale into insignificance contrasted with those which beset the *evaluation* of the remote consequences or sequelæ of *psychic* traumata. As Bailey, discussing traumata of the nervous system, remarks: "The psychoses, certain neuroses, and hysteria, when they arise

in pre-war service, (3) ordinary military service before the war. This because the rates of pension vary directly in accordance with the findings on these points.

In the Notes for the Guidance of Medical Officers in the Compilation of a Medical Report on an Invalid (Army Form B. 179), of issue April 1917, C.R. 31161/1 M., the following dicta are laid down:

(*a*) 1. Service during the present war. This is to be interpreted as service with an expeditionary force.

2. Climate. This means foreign climate where there is especial liability to contract a specific disease.

3. Ordinary military service. This means service other than with an expeditionary force.

(*b*) Constitutional. A disability is to be considered as constitutional if the soldier has a physical or mental predisposition to such disability.

(*c*) Attributable to or aggravated by want of proper care on the man's part, e.g. intemperance, misconduct, etc. Information can be derived on these points from the soldier's conduct sheet and medical history sheet.

* In cases where a Court of Inquiry should have been held, the medical officer is justified in deferring the case until it has been ascertained whether it is still possible to hold such court of inquiry.

from fright and similar causes, open endless questions as to predisposition, to previous attacks, and to auxiliary causes."

On the expert will fall the difficult task in such cases of appraising the valency of the different factors—contributory and others—which will enable him to ascertain how far the responsibility of the State is engaged.

We have thus singled out *nervous disorders* as they best exemplify the paramount necessity of close study of the medical *dossier* for eliciting, not only the exact nature of the causal event or casualty, but also for the controlling data to be drawn from the ancestral and personal history as to the evidences of predisposition to the disorder for which a pension is claimed.

## Is the Disability attributable to "Military Service"?

No wound or morbid disorder, irrespective of its gravity, necessarily opens the right to pension unless it can be ratified as due to "military service"—an "accident of war." * In other words, the disability or infirmity must arise out of or in the course of his vocation as a soldier.†

An accident signifies "the thing falling out, something which is done without intention." The term comprehends events with their causes and consequences. Turning to the ruling of recent decisions in compensation cases we find that the expression "by accident" includes not only:

(1) *Personal injuries which can be referred to as an accident*; but also

(2) *Cases in which there are no circumstances capable of being so described, but in which the results of the occurrence are so unexpected that it may be fairly considered as accidental.*

* Clause 7, Pension Warrant, April 1917: "To avoid misapprehension soldiers may be granted *gratuities for disablement not attributable to or aggravated by military service.*

"2. A soldier discharged as medically unfit for further service, such unfitness being neither attributable to nor aggravated by military service, and not being due to the serious negligence or misconduct of the discharged man, may be granted a gratuity or temporary allowance. The grant will be subject to such conditions as the Minister of Pensions may determine. In exceptional circumstances it may amount to a sum not exceeding £150, and generally it will depend on the extent to which the man is incapacitated, on the length and character of his service, and on the other circumstances of the case."

† "Any soldier who shall be disabled or mutilated by an accident which did not happen in the immediate execution of some act of military duty, or which, if it did so happen on duty was owing to his own negligence, shall not be entitled to a pension although he be discharged for such disability."—Clause, Pension Warrant, 1830.

In regard to (1), a wound or an attack of "trench feet," if it supervene in the course of "military duty," and be not due to any fault on the part of the soldier, is therefore an "accident of war" and involves the total responsibility of the State.

Similarly in regard to (2), if the soldier, during the performance of "military duty," sustains an abrasion of the leg and subsequently the wound becomes infected by *tetanus*, *glanders*, *anthrax*, or other infection. Here again the State is not only responsible for the mere anatomical results of the injury, but also the *consequences that may accrue therefrom.*

It will be the same if the soldier, after receipt of a wound and entry to hospital, contracts while therein an *infectious* disorder which retards its healing and aggravates the resultant incapacity.

It will be noted that in Army Form B. 179, the following question is asked:

"14. If the disability is an injury, was it caused:

"(*a*) In action?
"(*b*) On field service?
"(*c*) On duty?
"(*d*) Off duty?"

According to the answers forthcoming to these questions the responsibility of the State may or may not be engaged. Thus if the casualty occurred in the immediate execution of some "military duty"—viz. "in action" or on "field service"—the case is clear. But if it ensued when the soldier was "off duty," or if "on duty" was attributable to design, carelessness, or breach of discipline on his part, the responsibility of the State is not involved. But though not responsible for the *immediate* consequences—a wound or abrasion—the State may under certain circumstances be held so on account of the *sequelæ* that may accrue therefrom. Thus, presuming a soldier sustains a wound while "off duty" and that *subsequently* infection of the same should have ensued while "on duty," the responsibility of the State is total. In other words, if the soldier as a consequence of the mishap incurs a disability, such will be attributable to "military service."

Again, the evolution of a wound is more serious in a *diabetic*, for gangrene may follow; and the same is true of *malarial*, *tuberculous*, and *saturnine* subjects. Also its consequences may be more grave if the injured limb has sustained a *previous wound* or is the seat of *varicose veins*. Notwithstanding that the soldier presents these peculiar bodily conditions or blemishes, the responsibility of the State, whatever the consequences of the wound, is total. This, unless it can be established that the

*secondary* consequences of the wound were *inevitable*—whether the wound had been sustained or not.

The liabilities of the State, too, are greatly enhanced in that trivial wounds may, contrary to all expectations, result in death. Indeed this may occur some weeks or months after apparent cure, the injured soldier being carried off by *septicæmia*, *embolism*, and so forth. The same applies to *secondary hæmorrhage*, which may ensue some days, even several weeks, after an injury has been sustained. Despite the fact that death was unlooked for, and came as "a bolt from the blue," the responsibility of the State is total if the chain of causation can be established.

In short, in all the foregoing instances, not only is the *initial wound, but also its remote consequences, attributable to "military service."*

To complete our remarks, however, in this connexion it will be desirable to take, so to speak, a few test examples exemplifying the *clinical grounds on which to found our opinion as to whether or no a given disability or infirmity is attributable to "military service."* Our aim here is to establish the chain of causation, and as this is confessedly more difficult in *nervous disorders*, our observations may well be confined to their consideration.

### *Cerebral Concussion*

The attribution of cerebral symptoms to a previous concussion, "shell-shock," etc., is not uncommon. The claim that it was due to "military service" would probably be established if:

(1) There were circumstantial proof of the occurrence and adequacy of the impugned "accident of war."

(2) The morbid symptoms complained of ensued, if not immediately, within a reasonable interval. If a period of perfect health intervened between the accident and the appearance of symptoms, the interval should not exceed some weeks at a maximum.

(3) After the injury symptoms such as headache and giddiness appear from thence up to the time when more serious mental troubles become manifest. Given such *interconnecting* symptoms, in Sand's expert opinion one should not a priori reject their possible relationship to the accident, even though the intermediate period is of several months' or years' duration.

## Cerebral Tumours

Cranial injury, though insufficient to cause even a bruise, may suffice to initiate a growth as in a case reported by Fisher (1898);

and sarcoma, Pearce Bailey considers, is the variety more frequently occasioned thereby.

The attribution of a cerebral tumour to a blow on the head while on "military duty"—in other words, its *traumatic* origin—would be indicated by :

(1) The absence of any pre-existing cerebral symptoms.

(2) The onset of symptoms, not immediately, but after a few weeks. If symptoms follow immediately, it is probable that the tumour *pre-existed.*

(3) Localization of the tumour at site of injury.

(4) Character and appearance of growth as determined at the time of operation or necropsy—viz. if compatible with the period that has elapsed since the injury.

### Cerebral Abscess

Such may arise after head injury, though there be no lesion of the scalp or cranium. Generally speaking the *traumatic* origin will be conceded if :

(1) No other cause can be assigned. (It may result from a *remote wound* by metastasis. If identical organisms are found in both wound and abscess the ætiological relationship is probable, and if the primary wound be due to an "accident of war" the claim to pension is established.)

(2) Cerebral symptoms link up the accident and the subsequent abscess.

(3) The abscess is localized at the site of injury.

(4) At operation there will be found within the abscess a foreign body or a bony fragment, and if the characters of the abscess are compatible with development since the date of injury.

### Traumatic Neuroses

The attribution of neuroses to "accidents of war" is not uncommon, and we must beware of the following fallacies :

(1) The neurosis may have pre-existed the accident.

(2) It may have developed after the accident, but not necessarily as a consequence thereof.

In the former event analysis of the history may furnish evidence of its *pre-existence.* In the second contingency great difficulty may arise if the nerve troubles are *delayed in onset.*

The *traumatic* origin of the neurosis would be indicated :

(1) If no intercurrent affection, no antecedent or subsequent injury, explained more plausibly its genesis.

(2) If symptoms—headache, giddiness, insomnia, alteration in

character—have manifested themselves either intermittently or constantly in the period intervening between the accident and the onset of the neurosis.

(3) If the principal nerve symptoms are localized or stand in relation to the site of the injury.

(4) If, after complete recovery from the symptoms which immediately followed the accident, there elapsed a period not exceeding a year before the appearance of the neurosis.

But we have in these difficult cases also to consider whether the nervous manifestations are the direct outcome of *injury* or whether they are the product of *autosuggestion.* In short, whether the thought of a pension—the consequent brooding thereon—has not produced a condition of mind analogous to what industrial surgeons term " compensation hysteria."

In attempting to differentiate such a case we may postulate that a neurosis can only be admitted as the sequel of an accident if :

(1) The trauma involves shock or concussion.

(2) The injury produces some painful lesion or state which furnishes, so to speak, a basis for the development of a pessimistic or hypochondriacal mental atmosphere.

In regard of the first postulate it is clear that the diagnosis of concussion must be based on the details forthcoming as to the conduct of the claimant at the time of or immediately after the accident. It may be that others were involved in the same catastrophe. If so, did he walk alone, or, even more, assist a comrade ? Did he discuss the occurrence and show a lively recollection of all its details ? If so, the presumption of *concussion* or *shock* is most improbable, and the ætiological relationship of the injury correspondingly doubtful.

Again, our suspicions as to the symptoms being not attributable to " military service " would be strengthened if it transpired that after the alleged casualty the injured soldier exhibited no nervous symptoms, displayed no hypochondriacal obsessions, but returned to duty almost immediately. But only *after weeks or months* did he begin to manifest such proclivities. This lapse of a distinct interval after the accident—one devoid of symptoms—is typical of the morbid mental condition commonly termed a " litigation neurosis." On the other hand, true neurosis of *traumatic* origin is marked by no such discontinuity, no hiatus, no silent period, and though the symptoms may be accentuated during the period immediately preceding the granting of a pension, they are not solely attributable thereto.

In short, we are here confronted with a neurosis of purely *psychical* origin, the determining factor in the development of

which is the *impending pension*. If this assumption be correct the alleged disability—the neurosis—is *not attributable to the alleged cause, "military service."*

Now, if this state of mind be the outcome of brooding over the impending pension, it would seem obvious that the logical course, and the best in the interest of the subject, would be to *refuse a pension* in such cases.

The German Imperial Office has decreed that if a neurosis can be referred to this cause, the insurance authorities are not responsible. A like decision was arrived at in the French court in regard of a similar case. While as far back as 1909 in our own country a court of appeal held the arbitrator's decision "that brooding over the effects of the accident was insufficient to cause incapacity within the meaning of the Act" (*Holt* v. *Yates and another*).*

* Professor Ch. Julliard, of Geneva (*Rev. méd. de la Suisse romande*, July 1917), describes a peculiar mental state observed in prisoners of war. The Germans call it "barbed-wire psychosis." During an inspection of seriously wounded men in France by the Swiss repatriation committee he saw a case which presented close analogies to accidents in workmen. This suggested to him that under the influence of captivity a mental state might be produced similar to that described by Brissaud. For this condition he proposes the term "captivitosis." The patient was an Austrian civilian prisoner, aged about forty, who was under treatment in a military hospital for various symptoms. He had been examined several times by the committee, who arrived at no definite decision. The man, who kept his bed, complained of vague pains in the chest with difficulty of breathing and headache. His urine was loaded with phosphates. The pains, which flitted about from one region to another, were of a nature likely to induce the committee to recognize the case as one suitable for repatriation. A minute examination confirmed by the careful and prolonged observation of the doctor under whose care he was, showed no objective lesion except slight chronic bronchitis and emphysema. The man was extremely voluble in the endeavour to persuade the committee of the gravity of his condition. Repatriation was a fixed idea. A true psychosis could be excluded. Julliard, however, thought the diagnosis of simulation might be put aside, as, in spite of all that seemed to suggest it, the man struck him as being in good faith. On the other hand, autosuggestion was evident. As in labour accidents, the origin of the mental state was an erroneous idea of compensation. This notion was kept up, as in accident cases, by the careful treatment given him, and repeated examinations by a number of doctors. As no decision was come to, recovery was delayed for months, and no treatment was of use. Repatriation could not be advised, as the committee was convinced that the so-called disease would disappear with the cessation of the captivity. Nor could there be any question of punishment, as there was no simulation. Continuance of treatment would merely fix the false idea more deeply in the man's mind. The only solution of the problem seems to be to remove all hope by informing him that he was not considered a case justifying repatriation, and that he must be placed in a concentration camp. Julliard suggests the presence in such cases of a kind of "mental foreign body"—a fixed idea—producing certain psychical reactions. (*Brit. Med. Journal*, 1917.)

*Insanity*

In deciding as to the traumatic origin of mental derangement we should recollect that, though injury may originate a psychosis, it may simply aggravate a *pre-existing mental abnormality.* Or it may be that an *intercurrent* affection or a *previous infective* disorder may explain more plausibly the development of a psychosis, e.g. the *toxic insanities.*

Given exclusion of these sources of fallacy, our decision as to the *traumatic* origin of a psychosis will be guided by the following considerations. As we have said elsewhere : " If it be *immediate* after head injury or general shock, or if bodily or mental symptoms —notably changes of character, irritability, depression—have linked up, so to speak, the injury and the avowed psychosis, its traumatic origin would be conceded. Still, not necessarily so, if the character of the psychosis be reminiscent of one of known *slow* evolution, e.g. *general paralysis of the insane.* The symptoms of this disorder, though previously latent, may become manifest directly or a few days after the accident. If so, it would indicate that the psychosis was not caused, but aggravated or accelerated, by the injury."

Again, *immediacy of onset* does not necessarily postulate the derangement being a sequel of *trauma*—viz. if the subject had *previously* exhibited mental peculiarities which reappeared or became *more pronounced* after its occurrence. Now while it cannot be claimed that there is, so to speak, a specific form of *traumatic* insanity, still, certain characters are very noticeable, and should prove of considerable help when dealing with cases whose onset ensues gradually and some time after the receipt of an accident—viz. *secondary traumatic insanity.*

Krafft-Ebing, who has made a special study of traumatic psychoses, lays stress on the following characteristics :

(1) Marked irritability, which is more progressive and more emphatic than in idiopathic psychoses.

(2) The frequency of abnormal sensations referred to the cranial cavity and to the site of the injury.

(3) Disturbances of sensibility, hyperæsthesia.

(4) Tendency to vasomotor disturbances—flushing of the face and mucous membranes (conjunctivæ), and *intolerance of alcohol.*

(5) The persistence or reappearance from time to time of cerebral symptoms attributable to traumatic cause—apoplectiform or epileptiform attacks.

In conclusion, exigencies of space preclude our reviewing from this aspect the many other morbid disorders the development of which will be attributed to military service. But the responsi-

bility of the State being engaged, it is essential that every care be taken to obviate imposition—viz. false attribution of disabilities to " accidents of war."

## False Imputation or Substitution of Origin

Inasmuch as a soldier's disability or infirmity constitutes the basis of a claim to pension, the fact that his " personal interest " is involved cannot be overlooked. While his account as to the origin and nature of his disability should be listened to with attention and respect, it should be accepted with reserve, and only in so far as it may seem to be justified by collateral evidence. Such suspension of judgment should not be constituted as a reflection upon the honesty of the claimant. It is, indeed, the only attitude that befits the scientific physician who has to sift the chaff from the grain—to distinguish between the merely ignorant and the wholly dishonest claimant. For he has always to recollect that it is to the soldier's advantage to impute his disability or infirmity to " military service."

Accordingly, for the medical officer, there comes up the all-important question for decision :

*Is the alleged event, circumstance, or casualty—to which the disability is imputed—really responsible for its production ?*

In civil life—in claims for *compensation*—the plaintiff has often made antecedent defects or deformities serve over and over again as a basis for damages. Oftentimes have claims been lodged for accidents which have never occurred, or, if so, have not resulted in any injury to the applicant, or not in the manner affirmed. Similarly, naval and military surgeons of all nationalities have recorded numerous instances in which fraudulent practices have been resorted to to the end of obtaining a pension. In the majority of instances such has taken the form of *imputation to " military service " of morbid phenomena or symptoms recognized or ascertained to be alien to it.*

To estimate the *bona fides* of the claimant we have to decide whether the imputation is *unconscious* and *unintentional* or *conscious* and *intentional.*

*False Imputation through Ignorance.*—There are many instances in which the claimant *erroneously and in good faith* attributes to an accident some pre-existing disorder, the existence of which he was not cognizant of.

Thus the subject of *incipient tabes* may, while only in the *pre-ataxic stage* thereof, deem himself in perfect health. But if he meet with an injury and the disease hitherto latent become unmasked, what more natural than that the individual should

attribute these, as he believes, fresh manifestations to his recent injury. Bailey cites a striking instance of a man who instituted a suit for damages alleging that the locomotor ataxy from which he was suffering was the direct result of a fall from a railway car. In court he frankly acknowledged that he had suffered from "shooting pains" in the legs of a typically tabetic character for six years previously. By this admission he not only absolved himself from any suspicion of fraud, but gave almost certain proof that the disorder had *pre-existed* the alleged cause, e.g. the fall. In such a case it is clear that there is no *conscious* attempt at fraud—the claim lodged has its basis in the *ignorance* of the claimant regarding the ætiology of his ailment or disability.

*Pure Dissimulation without False Imputation.*—Under this heading many authorities would class that particular form of fraud which aims at the *concealment* of existing disease, deformity, or disability, to the end of gaining entry to the military or naval services. To our mind such persons cannot forthwith be held wholly absolved from an attempt at fraud.

For the would-be recruit who deliberately conceals some bodily flaw or defect, in full knowledge of its disqualifying value, does by inference convey a *false imputation as to his physical fitness.* As we have said elsewhere: "He, so to speak, imputes to himself the possession of good health, and by his cunning imposes this erroneous belief upon the examining physician. He may not actually lie or mislead by speech, but lying ought not to be understood as referring only to language; for we may lie by *our actions*, if by gesture or pose we behave in such a way as to deceive or delude those who have a right to expect from us the truth, the whole truth, and nothing but the truth." *

The defence for such behaviour is always this—that having presented himself for examination, any blemish should have been discovered by the physician. But whatever measure of blame be attached to the latter, it does not in any way absolve the would-be recruit of his attempt *to produce a false conviction*, and this for personal ends. This, unless it can be shown that the man deemed himself in perfect health and was ignorant that he presented any departures from normal.

The *concealment* of disease or disability is naturally more common in armies recruited by *voluntary enrolment*, for the *conscript* is generally more apt to magnify than to belittle his physical shortcomings. How frequently in the present war have men resorted to *dissimulation* rather than forgo the privilege of fighting for King and Country, and how difficult—nay, how ungracious—it seems to cavil at the dauntless spirit that would

* "Malingering, or the Simulation of Disease."

outstrip its frail clay. Nevertheless, while according such their due meed of admiration, we have to recollect that an unsound, and sooner or later an inefficient soldier is a burden rather than an acquisition to armies in the field. That our forbears were fully alive to this possibility is shown by their inclusion of a special clause in the Pension Warrant of 1829, in order to obviate a very serious evil—viz. "*the concealment of infirmities* at enlistment." As reference to our foot-note shows, such suppression of the truth—even given discharge for disability—entailed *forfeiture of pension.**

At the present time, too, such concealment still ranks as one of the offences in relation to enlistment as laid down in the Army Act.†

Having regard to the fact that during the present war false statements as to *age* have been common, it is interesting to note that it is laid down in regard to an attestation paper that "a false answer as to age should not be made the subject of a charge." But such is by no means as banal an offence as may appear to the uninitiated, seeing that *pari passu* with advancing years the *vis resistantiæ* lowers; what can be lightly thrown off by the youthful is a burden to the middle-aged combatant. Moreover, the older the man the more likely is he to be the victim of *latent* disease, which, becoming manifest under stress, is forthwith and unjustly ascribed wholly to "military hardships." If this be so in regard to mere age, what of the *concealed tuberculosis*, the *unavowed scraping or ablation of a testicle* or a lesion of similar nature! The withholding for patriotic reasons of such information we may condone, but not so the subsequent attempt to

* "If any person discharged from the Army for disability, or for any other cause, shall subsequently re-enter the Army, and shall, when questioned by the magistrate at the time of his being attested, conceal the fact or misrepresent the cause of his former discharge, he shall not be allowed to reckon his past service, nor to receive any pension, if again discharged for disability" (Art. 40, Pension Warrant, 1829). The following example may be cited: A soldier claimed a pension for aggravation of his disability during war service. On enlistment for present war, he concealed the fact that he had previously served in the Army and had been discharged for ill-health. It transpired, too, that he had been an inmate of a lunatic asylum, which experience he withheld. Examination revealed him to be of low general mentality and to be subject to confusional phases. Pension was refused.

† Sec. 33: "Every person having become subject to military law who is discovered to have committed the following offence; that is to say:

> "To have made a wilfully false answer to any question set forth in the attestation paper which has been put to him by, or by direction of, the justice before whom he appears for the purpose of being attested,

shall on conviction by court martial be liable to suffer imprisonment or such less punishment as in this Act mentioned." (Army Act.)

saddle the State with total responsibility for the *pre-existing lesion* with all its evil potentialities. In attempting to appraise the varying grades of conscious or unconscious dishonesty or fraud exhibited, the physician must, so to speak, reconstruct the psychological content of the claimant. This so that he may be in a position to analyse the nature and cogency of the actuating motives.

For the measure of moral turpitude varies widely in individual instances—at one extreme the merely ignorant, then the intermediate types just discussed, and at the other extreme the wholly fraudulent claimant, to consideration of whom we now pass on.

*False Imputation through Design.* Here the imputation is the outcome of a planned and deliberate attempt to deceive. Thus we have the individual who :

(1) At enlistment, knowing that he has a defect or flaw, conceals the same with intent to make capital thereof at a later date.

(2) In good faith joins up, but subsequently, as an afterthought, attempts to impute a lesion—of whose pre-existence he was cognizant—to military service.

(3) Attempts to establish an ætiological connexion between an injury and a coincident disorder of *non-traumatic* origin.

(4) Falsely alleges that he has had an accident of war and imputes *feigned* symptoms or *artificially* produced lesions thereto.

(5) Having sustained a *bona fide* wound, attempts to impute disconnected lesions thereto.

The foregoing constitute the more common of the unauthorized methods the soldier may invoke to procure for himself a pension, and a few illustrations may be of service. Thus a soldier may assign to " military service " the onset of diabetes, tubercle, or rheumatism—though perfectly cognizant that he had suffered from one or other disorder *prior to enlistment.* In some instances the essayed fraud is infinitely more glaring, thus, *mirabile dictu*—not infrequently, too—attempts have been made to impute the loss of an eye or a digit to an " accident of war," when the enucleation or amputation of the same had occurred prior to enlistment. Or the reservist, who has again joined up, may attempt to saddle the present war with the effects of a wound received in a *previous* war. We are reminded of a soldier who having lost a digit was asked where he sustained it, " In the war," quoth he, the inference being that it was in the present war. But cross-examination revealed the fact that he had incurred the loss in the South African War.

Duco and Blum cite the case of a soldier who was proposed for pension on the ground that he had suffered enucleation of an

eye. All his medical papers contained the same statement, "Enucleation of an eye. Wound of war." But in none did it transpire *who* had performed the operation. Inquiry elicited the fact that an operation had been performed *many years prior to mobilization.* The claimant on joining up did not mention his loss, and then subsequently attempted to impute it to "military service." The same observers state that they could cite many similar instances in which *amputation of the digits*—sustained prior to the war, without any relation to military service—had been subsequently attributed thereto to the end of obtaining a pension.*

Also we have to recognize the fact that soldiers sometimes resort to *automutilation* in order to obtain discharge, and with a pension, and to this end falsely allege their loss to have been sustained in action.† The sentry on his lonely vigil has been known to place one hand on the muzzle, and with his foot release the trigger of his loaded rifle. Sometimes, it is true, an enemy has done the soldier this service; this as a result of having

* A further striking instance culled from the experience of the present war is the following: A soldier, on being transferred to Class W of the Reserve, bethought him that he might make capital of a cranial injury which he knew to be of old date. The appearances of the scar were obviously incompatible with its recent production. To the medical officer filling up the Army Form B. 179, he attributed the lesion to a gunshot wound received at Ypres in 1915. This paper being subsequently mislaid, he on re-examination affirmed that the alleged wound was received on the Somme in 1916. The original form being recovered, he was taxed with the discrepancy in his statements; he then admitted that some five years before he was knocked over by an omnibus, sustaining a depressed cranial fracture for which he was trephined.

† Marshall relates: "During the insurrection of the Kandians in 1818, a private, and a tailor by trade, belonging to —— Regiment, and who had been only a short time in the Service, was on sentry a little in advance of a post occupied by British troops, and while on this duty he was occasionally fired at by the enemy from the surrounding jungle. This man was found severely wounded, the calf of the left leg being greatly torn, the whole charge of a musket having passed through it. He attributed the wound to a shot from the enemy; but the black charcoal ‡ on the leg, the nature of the injury, and the recent explosion of his own musket, told a different tale. He was, along with other men of the regiment, discharged, and received a pension of sixpence a day. When I was on duty in Edinburgh as staff-surgeon (1823), a pensioner applied to me to report on his case, in consequence of an alleged aggravation of the disability for which he had been discharged, with a view of moving the Lords Commissioners of Chelsea Hospital to increase his pension. He complained of a pectoral affection; but I learned from his 'instructions' that he had been discharged on account of a gunshot wound in the leg, the cicatrix of which he uncovered with great reluctance, and by this means I recognized my old patient the tailor. He disappeared without repeating his solicitation for me to report upon his alleged pectoral complaint."

‡ But the modern soldier, fully alive to the tell-tale evidence of a singed skin, etc., takes the precaution of swathing with his puttees the foot or hand he intends to injure before discharging his rifle.

deliberately exposed his hand to such possibilities, when entrenched in close proximity to the hostile force. Again, it sometimes happens that, having sustained a bullet wound in leg or arm, and the same having undergone a perfect cure, the war-worn hero perhaps not unnaturally feels aggrieved that now there is no chance of his receiving a pension. Accordingly, as an afterthought he seeks to link up with the said casualty some *old-standing eye or ear trouble.* Or without the saving grace—a wound sustained in action—he attempts to impute to " military hardships " a lesion not only of *non-traumatic* origin but, forsooth, due to his " own misconduct." Thus the mud of Flanders may be blamed for a so-called " rheumatic " joint which he knows is in reality the sequel of a *gonococcal* infection. Again, a soldier may falsely allege that he sustained a wound in action—producing an ancient scar in proof thereof. For example, the *cicatrices of common ulcers* have been shown as the result of gunshot wounds, and Hennen, an old Peninsular surgeon, narrates that he once saw the marks of a *square* blister attributed to the contusion by a bullet.

While we should be quick to note any indications suggestive of fraud, we should at the same time beware of rash conclusion. A case will illustrate the point : An old soldier up for pension alleged paralysis of the right arm in sequence to a shrapnel wound in the axillary region. On investigation it was found that he had sustained such a lesion in the Boer War with sequential brachial paralysis, from which, however, he had recovered. This seemed to suggest the possibility of his making capital of his ancient lesion, and that his paralysis, if not actually simulated, was at any rate only functional. Further inquiry, however, elicited that he had actually received a wound at the same site during the retreat from Mons !

In conclusion, it now remains for us to indicate the clinical features that would suggest doubt as to the alleged ætiology of a disability or infirmity.

## Clinical Discrepancies suggestive of Fraud

The formation of an expert's decision should be based on analysis of the facts elicited as to the *nature of the casualty*, the *evolution of the case*, and the *objective findings.*

Now if the account of the casualty, the sequential symptoms, and the lesion exhibited are in accord, or, as it were, in logical sequence, the presumption that the alleged injury is responsible will be assured. Conversely, if discrepancies emerge, it is essential in the interests of the State that the case in all its bearings be narrowly scrutinized.

*Nature of Lesion incompatible with alleged Mechanism of its Production*

If injury be the assigned cause, we should, of course, look carefully for signs of *anatomical lesions* such as, judging from the nature of the casualty, are likely to ensue. A medical officer cannot exercise too much caution as to the alleged cause of wounds, and should as far as possible distinguish between wounds occasioned by the fire of the enemy and *simulated* injuries,* also those *voluntarily* inflicted.† Generally the soldier who maims himself has two ends in view—to be discharged, and at the same time to secure a pension—hence he pretends that the wound was sustained "in action." Because of this possibility of *false imputation* as to their origin we have in a foot-note referred to the salient characters of self-inflicted wounds.‡

During the present war attempts have been made to saddle a wound of the eyelid as being the cause of intra-ocular *congenital* lesions—*colobomata* of iris and choroid—this, forsooth, without any penetration of the eyeball. Again, we know of an instance in which a soldier claimed a pension for defective vision—attributed by him to a wound of the cheek received in action. The lesion was situated on the right side of the face, two and a half

* Cæsar, in the blockade of Utica, speaks of the simulation of wounds: "Qui omnes, discessu curionis, multique præterea, per simulationem vulnerum, ex castris in oppidum propter timorem sese recipient." ("De Bello Civ.," lib. ii, xxxv.)

† (1) *Character.*—Superficial cuts or incisions not extending below the true skin. The larger and deeper the wound the less reason for suspicion.

(2) *Site.*—Front of the body, on the right or left side, according as to whether the person is right- or left-handed. Too much stress must not be placed on the site as evidence of the improbability or impossibility of its being self-inflicted. This for the reason that a soldier may invoke the aid of a comrade-in-arms.

(3) The site of the wound does not coincide with that of rents or other marks on the dress.

(4) Its character is often at variance with the alleged mode of production. Thus it may present a clean-cut surface although the cause alleged would have been more likely to produce a lacerated or contused wound.

‡ Marshall narrates: "I was once requested to visit an officer for the purpose of dressing a gunshot wound of the left arm, which he alleged had been received during a conflict with the enemy. He commanded a small detachment a few miles in advance of the post where I was stationed, and left his party in order that, as he stated, I might examine and dress his wound. Upon inspecting the site of the alleged injury no wound could be discovered except an abrasion of the cuticle, about the size of a large pea, which appeared to have been done with a penknife. Care had been taken to destroy the sleeve of the jacket, so that it was impossible to obtain any information respecting the cause of the alleged wound by examining the clothes. I recommended the officer to return forthwith to the station he commanded, and he followed my advice."

inches below the orbit. Examination revealed that his defective vision was due to *refractive errors.*

Turning to another sphere, if it be an instance of injury to a joint, e.g. *dislocation,* we should take into consideration the *position* of the limb at the time of the accident, and the *degree* and *direction* of the violence. We could then visualize the circumstances of the casualty—this in light of our anatomical knowledge of the structures most likely to be damaged thereby. Thus, dislocations of the shoulder usually occur when the limb is in a position of *abduction* ; and the same is true of the hip.

The production of *fractures* also being determined by mechanical factors, critical analysis may reveal irreconcilable discrepancies between the character of the accident and the nature of the lesion attributed thereto. Thus inherent improbability would attach to a person's statement that, having fallen upon a bent knee, he sustained a fracture of the patella—moreover of the simple *transverse* type. Such a form of fracture is nearly always due to *muscular violence*—the victim usually subsiding on his knee *after* the patella has snapped. Moreover, direct fractures of the patella are more often starred, oblique, or even longitudinal.

To sum up, the *character* of the lesion is largely determined by the *mechanical conditions obtaining at the time of the casualty,* and the apprehending of discrepancies, it is clear, is of the utmost importance in cases involving pensions or compensation.

*Character of Lesion incompatible with Recent Production*

The *time element* in cases claiming pension or compensation may be of prime importance in establishing the *bona fides* or not of the claimant. It may well be that the lesion under review was caused by a casualty, but not by the particular one at issue. Its nature may preclude the possibility of its being due to the cause assigned. A corneal *leucoma*—which to the initiated is obviously of long standing—may be imputed to a recent accident. The same is true of *nebulæ, congenital amblyopia, ancient trachoma, occluded pupils*—all of which have at one time or another been offered for the persuasion of the credulous or unsophisticated.

*Cicatrices* of old date, and in all regions of the body, have been a fertile source of fraudulent claims. Time-worn *herniæ* are often falsely imputed to recent strain despite obvious evidence to the contrary.

Sometimes, too, the subject has taken advantage of a congenital defect—*ectopia testis*—and has knowingly attempted to pass it off as a rupture due to a strain lately received. Again,

long-standing deafness due to a *sclerosing otitis* of *syphilitic* origin has been falsely imputed to an "accident of war."

In most of the foregoing instances the *date* of the casualty and the *maturity* of the lesion are in such obvious conflict that the possibility of any ætiological relationship between the same and its alleged cause is forthwith excluded. We are therefore justified in affirming that the *morbid state or disability pre-existed the casualty and is not attributable thereto.*

In the region of *nerve disorders* we are very liable to misconception as to the influence of trauma in their causation. Frequently wounds or injuries to the head or elsewhere may determine efflorescence of a latent nerve disease, e.g. *tabes dorsalis, general paralysis of the insane, epilepsy*, etc.

In such cases, before we can appraise the valency of the trauma it is necessary to ask: Was or was not the subject a healthy man before the accident? Especially important is this in *epilepsy* and *general paralysis*, for the former frequently begins in adolescence, and the injury to the head, less palpably due to a projectile, may have been due to *a fall in sequence to a fit.* In the same way, in general paralysis the injury to the head may have been the outcome of an epileptiform attack. Again, in the case of a *tabetic* it should be recalled that *ataxy* of the legs predisposes to falls, especially in the dark, while the fragility of the bones favours the occurrence of fractures. In all the foregoing instances it is clear that we run a great risk in attaching too high a value to the alleged exciting cause. In such cases, too, much credence must not be placed in the statements of the subject himself. His ignorance as to his previous state of health may be real or assumed. He may deny that he has had *syphilis*, but the truth of the assertion should be checked by the presence or absence of scars or other specific lesions.

In short, in all cases of this category—in which monetary gain is at stake—we should recollect that, though often unconsciously, yet the claimant may be seeking to saddle *total responsibility* for his pre-existing disease upon a banal injury. In the examples cited we should be justified in affirming that the alleged accident is not the cause, but the *occasion* of the appearance of the malady under review.*

* As showing the variety of cases that come up for judgment we cite the following instances from Duco and Blum:

An ordnance officer having been invalided for *hip-joint disease* claimed a pension. He attributed his infirmity to a fall on the knee. Inquiries showed that *twelve hours* after the fall he was admitted to hospital—the morbid condition in his hip being then in an advanced stage of evolution. The report of the expert ran as follows: "The fall has not provoked a coxalgia. It is impossible to admit that hip disease—the evolution of which is always gradual—can have

*Mode of Evolution of Case Unusual*

Given the lapse of a certain period after an alleged injury, say of a joint, one should always ask oneself the question: Are the local appearances such as one might expect? Thus if only three or four weeks have passed since its occurrence, and the joint nevertheless exhibits all the marks of *long-standing disease*—pronounced muscular wasting, capsular and tendinous retraction—such should arouse suspicion of attempted fraud.

Again, if the alleged accident was trivial, its results nothing more than a mild synovitis, one should, given appropriate treatment, expect it to have subsided within a month or six weeks. If not, and careful examination aided by *skiagraphy* revealed no occult cause, we should canvass the following possibility: the soldier may have neglected to carry out the treatment prescribed, or, worse still, may have taken active measures to aggravate his condition. This in order to exaggerate his disability in the hope of increasing his pension or allowance.

*Ætiological Factors other than those assigned may intrude their Influence*

Injury sometimes determines the appearance of infective arthritis—*gonococcal*, *syphilitic*, etc. Interesting questions may then arise as to how far an alleged trauma can be held responsible for their genesis. For obviously an unscrupulous man—fully aware of the possible consequences of such an infection—may impute it wholly to an "accident of war" with a view of obtaining a pension. It will therefore, perhaps, be helpful to indicate the conditions under which trauma is more clearly established.

*Gonococcal Arthritis.*—Suppose the claimant has had previous

been produced in a few hours. The disorder does not appear to have been even aggravated by the trivial accident—a fall upon the knee in the officers' quarters. The fall invoked is readily explicable as the outcome of the weakness of the limb—the seat of an advanced tuberculous process. The fall, then, is the effect, not the cause, of the affection.

"Conclusion: The infirmity attributed to a fall does not appear to be the result of the alleged accident, nor, medically speaking, to have been occasioned or aggravated by the said accident."

An officer of the reserve, after eight days' campaigning, claimed a pension for *chronic bronchitis and emphysema*. He produced a certificate which affirmed that he had been exposed to rain and had contracted bronchitis. The experts who examined him refused not only to admit the valency of the alleged cause, but also held that it had not in their opinion even aggravated his chronic bronchitis. This for the reason that the condition required many years for its development, and that the circumstance invoked was nothing more than an unimportant episode in the evolution of a chronic disorder.

attacks of gonorrhœa, but without *arthritic* complications. If after a fresh infection he, in sequence to *contusion of the knee*, develops gonococcal arthritis in the same joint the responsibility of trauma would appear to be total. Likewise if, being engaged in work involving great strain on one or other of his arms, he develops a similar arthritis in the joints thereof.

In *syphilitic* arthritis the valency of trauma would be clearly assured: (1) if the syphilitic arthritis were localized to the injured area or strained limb; (2) if simultaneously there were no other specific phenomena; (3) if the arthritis appeared within a reasonable period—viz within the limits of the customary incubation period.

*Tuberculous Arthritis.*—The responsibility of injury would be clear, given the following conditions: (1) a circumstantial account of injury; (2) definite lesions at the site thereof, bruising, swelling, etc.; (3) coincidence of the tuberculous arthritis with the site of injury; (4) absence of tubercle in other organs; (5) onset of the tuberculous arthritis not earlier than a month and not later than six months after the injury.

In conclusion, exigencies of space preclude us from discussing further the many interesting questions that cluster round this thorny subject, the establishment of the exact ætiology of a given case; and all we have here attempted is to indicate the lines upon which the study of doubtful cases should proceed.

## Is the Disability or Infirmity aggravated by "Military Service"?

Granted that an individual has been passed into the Service, the responsibility of the State is engaged if through "military service" he suffer aggravation of any disability or infirmity of which he is the victim.

The Nemesis of lax recruiting is here very clearly displayed, for nothing is more certain than that the results of "military service," as manifested in a healthy soldier, differ profoundly from those that ensue in individuals already the subjects of certain diseases.

Moreover, we have this further difficulty—one especially notable in the victims of *subjective nerve disorders*—that *aggravation* in their case is frequently but another term for *exaggeration*, either *conscious* and *intentional* or *unconscious* and *unintentional*. The soldier up for a pension, like the claimant in a railway compensation case, cannot afford to make light of his symptoms. One sees it very clearly in those whose pension is yet to be made *permanent*. Obsessed with fears either that their allowance may

be reduced or withdrawn, there is but grudging concession to the *vis medicatrix naturæ*—but little avowed response at any rate to the efforts of therapy. Nor can he be wholly blamed, for the, so to speak, medico-legal atmosphere into which he drifts exerts a baneful effect. It fosters morbid introspection, and always are there at hand friends or relations who—acutely alive to the advantage of a pension—brim over with sympathy.

Moreover, the repeated examinations he undergoes, the indiscreet professional remarks he overhears or misconstrues, all lead to "a summation of excitements which has a prolonged effect and finds its expression in neurosis."

Arrived at such a state, the subject, say of a *traumatic neurosis* or *neurasthenia*, may complain of symptoms out of all proportion to the injuries he has received. Now, as Bailey wisely remarks, "the discrimination between exaggeration of this character, which is the voicing of disease and consequently sincere, and the variety of exaggeration which is the outcome of dishonest greed, often cannot be effected by the medical aspects of the case alone."

The assumption that the accident *had aggravated a pre-existing neurosis* would be probable if:

(1) Fresh symptoms appeared almost immediately.

(2) Pre-existing symptoms underwent rapid and notable intensification.

(3) If when under constant surveillance the subject conducts himself at all times in a manner consistent with the aggravation of the symptoms he complains of.

In the sphere of *organic* nervous disease we may take as an example *tabes dorsalis*. Now, aggravation of the same after injury might be taken as established if the tabetic troubles manifested themselves first or more severely at the *site of injury*, e.g. as evidenced by ataxia and anæsthesia of the left arm after injury of the left hand, as in a case reported by Oppenheim. As instances of how accident may aggravate an existing *tabes*, Goldscheider noted the rapid development of *blindness* in sequence to chill and strain of the eyes—and Renvers sudden blindness after *laparotomy*.

Again, the subjects of *diabetes*, *arteriosclerosis*, or *syphilis* always live, so to speak, on the edge of exacerbations of their particular maladies through mental anxiety, exposure, over-exertion, irregularities in diet, traumatisms, and so forth—conditions inseparable from "military service"—and the same is true of the victim of *chronic interstitial nephritis*, or *alcoholism*.

Needless to say, we should not depend wholly on the subject's statements—his subjective symptoms—but should rely more on *objective* phenomena, as evidence as to whether aggravation

through "military service" has ensued. Thus, in diabetes—wasting, diarrhœa, drowsiness; in arteriosclerosis—vertigo, persistent headache, breathlessness; in syphilis—nerve symptoms would, if previously uncomplained of, supply unmistakable proof of these disorders having been aggravated.

If we may, however, judge from the records of *compensation* cases, the chief difficulties would cluster around pre-existing disease in relation to *trauma*. In other words, *did injury in the shape of physical violence aggravate a pre-existing state or morbid lesion?*

Take, for instance, the *tuberculous* subject or the "*bleeder.*" A slight blow or a fall, the effects of which in a healthy individual would disappear in four or five days, may in the one determine a tuberculous arthritis; in the other a hæmarthrosis with ultimate osteoarthritis.*

These instances clearly show how readily injury, often trivial, compasses the aggravation of *pre-existing* disease.

Again, take a case of existing *phthisis* held to be aggravated by a contusion of the chest wall while on "military duty." Such occasionally evokes an attack of *hæmoptysis*. If the latter occur within a day or two it may reasonably be referred to the said "accident of war," and accordingly the aggravation of the phthisis through "military service" would be held as established.

But what if no hæmoptysis ensue, and yet nevertheless it is claimed that the evolution of the tuberculous process has been *markedly hastened* by the accident! Here we should be very chary of ascribing to injury such aggravation if *very advanced lesions* are detectable within a *few days of the accident*. On the other hand, if the tuberculous lesion had been for long quiescent and apparently cured, and then *marked efflorescence* ensued after the accident, the responsibility of the trauma must be conceded.

Again, in instances in which a *tuberculous* organ—a gland or a joint—suffer direct injury with subsequent *generalization* involving the lung, the responsibility should be admitted if:

(1) The local tubercle were not advanced.

(2) The general nutrition was good.

(3) Pulmonary symptoms appeared within six months.

We have taken these various tuberculous lesions as examples of how a plea of aggravation may be refuted or established, and

* An Army Council Instruction states that in all cases in which officers or soldiers have developed pulmonary tuberculosis during overseas service, it will be regarded as caused or aggravated by military service. The same assumption will apply to all other cases unless the military board is satisfied that pulmonary tuberculosis was present previous to the man's enlistment, or to the granting of the officer's commission, or that it was not aggravated by his service.

the same course of analysis should be pursued in regard to *cardiac* or other disorders—the greatest stress being laid on *objective* phenomena as evidence of the *bona fides* of the claimant.

## Fraud in Relation to Aggravation

Aggravation, as we have before remarked, is often merely another word for *exaggeration*—that most common form of malingering. Naturally it finds its greatest scope in the sphere of *subjective nerve disorders.*

It is in these cases often extremely difficult to decide whether the exaggeration is *conscious* or *unconscious.* The exaggeration may be but a symptom itself of the disease—a fact which needs some emphasis. It is the more difficult in that there are present symptoms the genuineness of which is undeniable. Accordingly it often resolves itself into a question of determining how far the real symptoms are *voluntarily* magnified.

In very many instances—although we may have a shrewd suspicion that such is the case—it may be impossible to adduce formal proof thereof.

Occasionally the subject is amenable to argument, and may be made to see that his claims are exaggerated. But not infrequently they are impenetrable to reason. In such event the physician's experience will be his best aid to the proper appraisement of the claimant's *bona fides.*

He may derive great help, too, from the information supplied him by other skilled observers under whose surveillance the subject may have been for some time prior to examination. Also, as pointed out in our previous work, the physician will, if there be definite grounds for suspicion, be justified in applying *direct tests* for the detection of exaggeration.*

Apart from the exaggeration of subjective symptoms, the claimant for pension may deliberately *superimpose feigned symptoms* upon a basis of true disease. He may go further and provoke aggravation of his state or symptoms by artificial means. Thus the individual who suffers from *varicose veins* may constrict the affected limb by tight bandages or garters to produce *œdema* or retard the healing of a *varicose ulcer.* The subject of a *fractured thigh* may remove his extension apparatus so as to delay union. The sufferer from *nephritis* may add *egg-albumin* to his urine; and in the same way the victim of *cardiac neurosis* may, before an expected examination, swallow tobacco juice or take drugs to increase the cardiac irritability.

* "Malingering, or the Simulation of Disease."

### Is the Disability or Infirmity attributable to Climate ?

From time immemorial the influence of climate on the production of various forms of disease has been widely recognized. We all recall how in *The Winter's Tale,* Leontes welcoming Florizel and Perdita to Sicily exclaimed :

> The blessed gods
> Purge all infection from our air, whilst you
> Do climate here !

Truly a shrewd forecast when we reflect that nearly all the so-called *climatic* diseases are in truth *infections—insect-borne.* Thus *malaria* is propagated by the mosquito ; *trypanosomiasis* by the tsetse-fly ; simple continued fever by a sand-fly ; *kala-azar* by a bug ; African tick fever by a tick ; and the *bubonic* form of *plague* not infrequently by the " rat flea."

We see, therefore, how our conceptions of the word " climate " are becoming modified, and this chiefly in the direction of expansion. Formerly by it was implied the annual *temperature* of a place ; and heat, it is true, promotes the growth of pathogenic germs. But now we recognize the inclusion of many other factors also, such as moisture, atmospheric pressure, and electricity, all of which must be viewed in the light of their effect upon animal and vegetable life.

In Army Form B. 179, we read that :

" *A disability is to be regarded as due to climate when it is caused by military service abroad in climates where there is a special liability to contract the disease.*"

A man under the obligations of " military service " may be dispatched to countries or regions in which certain diseases are endemic or epidemic.

By *endemic* is implied that the disease is confined within certain areas, is the outcome of local or localized causes, and has a tendency to persist in a particular region. By *epidemic* is understood a disease which suddenly appears, spreads widely and rapidly, but the prevalence of which is usually of limited duration.

In the rubric of *endemic* diseases may be classed *malaria,* the various forms of *dysentery, remittent fevers, sleeping sickness,* etc. In the category of *epidemic* diseases would fall *cholera, yellow fever, plague.*

From the definition afforded us in the Army Form it is clear that no distinction is drawn between endemic and epidemic diseases—and in truth no such sharp differentiation is possible. Thus Malta fever, dysentery, leprosy, and other endemic diseases may at times assume *epidemic* form. It is clear, therefore, that

in the case of a soldier, affiliation of this or that tropical disorder to "military service" will depend on whether his obligations have entailed his residing "in climates where there is a special liability to contract the disease."

Among the troops at Gallipoli dysentery, typhoid, paratyphoid, and epidemic jaundice were prevalent; and in Salonika malaria and Malta fever. In Egypt dysentery, sand-fly fever, Malta fever, claimed their victims; while in France many fell a prey to epidemic jaundice, trench fever, and trench nephritis.

*Maladies as "Accidents of War."*—It will, of course, be understood that a soldier may contract a tropical disease, though he has not actually resided in a region in which the particular disorder is *endemic*. Here we may remark that there is a tendency to identify *maladies* contracted through the obligations of "military service" with *wounds* sustained under like conditions. In short, there is an inclination to place them in the same category as "accidents of war." This, doubtless, is the reflex of recent decisions arrived at under the Workmen's Compensation Act, and which may be summed up as follows:

Certain infective disorders—*scarlet fever*, *diphtheria*, *small-pox*, *cholera*, etc.—if contracted under certain circumstances, are apprehended as the result of an "industrial accident."

Turning to the soldier, it cannot, we think, be doubted that in regard to *malaria*, *yellow fever*, *plague*, any of these, if contracted in a region or town in which these diseases are unknown, would be classed as the outcome of an "accident of war." These particular disorders are propagated by the mosquito and the "rat flea," and the transference of these disease-bearing agents to distant ports is a matter of common knowledge. It would, therefore, seem impossible to deny that the responsibility of the State is engaged if the soldier contracts one or other of these disorders through the obligations of "military service."

*Neglect of Personal Hygiene.*—Occasionally, however, attempts are made to attribute to a tropical climate disorders which are rather to be referred to neglect in *personal hygiene*. In short, the man fails to adapt his habits to the climate, indulges in overeating and overdrinking, or is careless in the matter of exposure to the sun. Or worse, he fails to take ordinary precautions against bites of mosquitoes, etc., or is careless about boiling his water or milk. Such behaviour cannot be overlooked as trivial, inasmuch as the health of his comrades is also compromised.

*Intrusion of other Factors.*—The so-called diseases of tropical climates often resolve into cases of impairment of health due to *alcoholism* or *syphilis*. On the authority of C. W. Daniels we have it that overindulgence in alcohol in the tropics ends in

*hepatitis* and other disorders. *Liver abscess*—otherwise of rare occurrence in natives—occurs among those who take to drink. He holds, too, that overdrinking in Europeans is a fertile source of neurasthenia.

As showing the danger of attributing off-hand a breakdown of health to residence in a tropical clime, we may cite the following instance. One of us was consulted by a man invalided home from West Africa said to be suffering from *tuberculosis* of one apex, complicated by *rheumatism* of one ankle-joint. A papular eruption on the forehead excited suspicion of *syphilis*, which was converted into certainty by detection of a node on one tibia. Taxed, he admitted having exposed himself to infection, and his quick response to mercurial treatment left no doubt of the condition being one of *secondary syphilitic arthritis*. The existence of a temperature—the so-called secondary syphilitic fever—doubtless accounted for the erroneous diagnosis of tuberculosis of which there was no proof.

In light of this and similar experiences we should be chary of dismissing off-hand an enlarged liver to climate—this at any rate until we have excluded the possibility of its being due to *alcoholism* or *syphilis*.

Nor should we overlook the fact that tropical diseases have been *simulated—dysentery* by the admixture of blood from other sources with the stools; *elephantiasis* by constriction of the limb by a ligature, and so forth.*

## Is the Disability or Infirmity aggravated by Climate?

We are told that the rates of pension vary directly according as to whether the disability or infirmity was contracted during the present war; or was due to "climatic disease in pre-war service." In the case of old soldiers, who have rejoined, it should be relatively easy to ascertain whether or no they have previously served in tropical climates, and what diseases, if any, they contracted in those regions.

In the case of the New Army it is obvious that there may be much difficulty in establishing whether or no the claimant has at any previous time been the victim of a tropical disorder. Given that a man had, say in the South African War or while on service

* "Marshall mentions a case where an appearance of the limb simulating elephantiasis was produced by a ligature. This man had been sent to Chatham from India to be invalided. The thigh measured in circumference twenty-two and three-quarter inches, the calf of the leg seventeen and a half, and the ankle fifteen inches; in six days after the removal of the ligature, the thigh had decreased to twenty inches, and the other parts in proportion." (Gavin on "Feigned Diseases.")

abroad in India, etc., contracted malaria, and subsequently during the present war had suffered a relapse, the question would resolve itself into whether or no the disorder has undergone aggravation. In the case of malaria this may be assumed if *cachexia* or profound *anæmia* ensue, or *chronic nephritis*, which latter occasionally follows repeated infections. It should be recollected, too, that malaria predisposes to other diseases—viz. dysentery and tuberculosis.

In amœbic dysentery the formation of *abscess* or the supervention of *arthritis* in bacillary dysentery may constitute proof of *aggravation*, and so on.

## Is the Disability or Infirmity Constitutional or Hereditary and not aggravated by Service during the Present War?

Difficult, in sooth, is this question, and doubly so in light of the hurried manner in which recruits were enrolled. Glaring defects in the subject himself but too often passed unrecognized —how slender then the chance of any attention being paid to ancestral proclivities! But when up for pension these sins of omission exact their penalty, and unfortunately there exists no *dossier* to which we can turn for aid.

Again, the soldier, if well informed, may be quite aware that any statements he vouchsafes as to the health of his forbears may weigh against his chances of obtaining a pension. Undeterred thereby the honest man may volunteer all desired information, but what of the ninety and nine whose real or assumed ignorance renders all efforts at investigation futile. Only too likely, then, is it that the upright may be penalized by his honesty—may incur loss or diminution of his pension—which latter by default the merely ignorant and the knave alike may secure. In other words, in the latter instance, no evidence of heredity being forthcoming, the claimant gets the benefit of the doubt, and his disability or infirmity passes as *wholly* attributable to "military service."

In this *impasse* we are at a sad disadvantage as compared with our French colleagues. In that country, when the nature of the case postulates a *constitutional predisposition*, the following procedure is instituted. The certificate of origin of the disorder is judged in light of the results of an inquiry by the police into the health of the soldier prior to enlistment and that of his ancestors and collaterals. (*Procès-verbal d'une enquête de la gendarmerie.*)

The facts thus elicited, and the particular hardships endured by the claimant in his military service, are then contrasted in

view of the causal relationship postulated. To clarify the point at issue, specific information is demanded as to the soldier's state of health while on service, the particular arm he served in, and the duration of his sojourn or sojourns at the front. Special note is taken of the nature and duration of any circumstances a priori likely to have aggravated the existing malady. In this way a measured decision is arrived at as to whether the disease is purely hereditary or whether it has or has not been aggravated by the hardships and dangers of military service.

We, as said before, have no existing machinery wherewith to supplement the claimant's ignorance or to check his veracity. Apart from this, too, we are beset by the inherent complexity of the subject, heredity, around which no little controversy centres, and to this we shall now briefly refer.*

## Some Features of Heredity

The influence of heredity is shown in many diseases, and *pari passu* with increasing knowledge the number capable of transmission is being added to. But, as Hastings Gilford has pointed out, the most common form of heredity is that termed *family* or *familial*—viz. the disorder appears amongst brothers and sisters, and not between parents and children. Thus there are certain diseases which appear in some families more than in others, and which are regarded as hereditary. Note the tendency to the production of *cataract* in successive generations, and in other families the strong predisposition to *hæmorrhagic diathesis.*

Again, turning to *infective disorders*, how very notable is the susceptibility in some families as compared with others. Like the *carnivora* some are practically immune to *tuberculosis*, while others easily fall a prey thereto. The tubercle is not inherited, but the *defective immunity is.* The same applies to rheumatic fever, malaria, and then how dire the effects of *syphilis*, *lead*, or *alcohol* in some families as contrasted with others! Reflections such as these lead one inevitably to Harry Campbell's conclusion that " heredity plays a part in the causation of all non-traumatic disease."

It is important also to recognize another type known as *indirect* or *transforming heredity*, which " consists in the transmission of a proclivity, not to the same disease, but to other disease of a similar nature." This particular type is well displayed

* In the Notes for the Guidance of Medical Officers in the Compilation of a Medical Report on an Invalid (Army Form B. 179), of issue April 1917, C.R. 31161/1, M., we read that " A disability is to be considered as ' constitutional ' if a soldier has a physical or mental predisposition to such disability "

in *prenatal malformations*—club-foot, cleft-palate, hare-lip, etc. How frequently do such anomalies of growth and development occur in different individuals of the same family !

Equally striking, if less frequent, is the evidence of such a family proclivity to certain *diseases*. Thus Sir Clifford Allbutt observes that he was "once called in consultation to a father and three children whose maladies were as follows : carcinoma, lymphadenoma, pernicious anæmia, and pseudo-hypertrophic palsy."

As Hastings Gilford remarks : "Such a conjunction of three rare diseases cannot have been due to mere chance ; their association in the same family, and their evident transmutation one into the other, in different individuals, is almost as good evidence of the heredity of each of them as if the same disease had occurred in all four members of the family."

The foregoing considerations—all too brief as they are—will at any rate suffice to show the intricacy of the problem presented, the difficulty of rendering a satisfactory answer to the question :

## Is it Hereditary and not Aggravated ?

It is in the sphere of *structural* defects that the conclusion that some hereditary influence is at work seems inevitable. The study of congenital abnormalities supplies numerous illustrations of the *descent in families* of such variations from the normal structure. Moreover these defects of anatomical variation being stable and uninfluenced by environment, they may well form the starting-point for our animadversions on this question.

### *Congenital Abnormalities*

During the progress of the present war it has sometimes happened that soldiers—occasionally with fraudulent intent—have alleged that their vision has undergone deterioration as a result of military service. But expert examination has revealed the existence of some congenital defect or lesion. Thus, for example, it may be an *opacity of the lens*—a *polar* or *lamellar cataract* which dates from birth. Or it may be an instance of *congenital amblyopia* associated, as it sometimes is, with defects of the choroid or retina.

Recently a soldier came up for discharge with pension, alleging that he had suffered deterioration of vision as a consequence of having been "gassed." But expert examination revealed the existence of *opacities in both lenses*.

Again, superficial wounds in the neighbourhood of the orbit,

but not involving the *eyeball*, have been held responsible for a cleft in the iris or choroid, when in truth the lesion was a *congenital* coloboma.

It might be thought that cases of Thomson's disease or *myotonia congenita* would scarcely have found an entrance into any army. Nevertheless, Sand states that several cases have been enrolled in the Prussian army and, worse still, penalized as malingerers !

The same is true of *muscular dystrophies*. Raymond, 1904, exhibited before the Paris Academy a French soldier, the victim of *scapulo-humeral myopathy*, and who, moreover, had been punished for his weakness and incapacity !

Now, presuming that we are confronted with claimants for pensions exhibiting the above or similar congenital defects or disorders, we may safely say that they are *hereditary*, and, moreover, *not aggravated* by military service. The examples above cited are hereditary in the *familial* sense, even as are *colour-blindness*, *retinitis pigmentosa*, etc.

### *Nervous Disorders*

Owing to their early onset and pronounced character, the more typical examples of hereditary nerve disease are very unlikely to be met with in this connexion. We allude to Friedrich's ataxia, hereditary chorea, microcephaly, hereditary spastic spinal paralysis, and so forth.

The foregoing disorders are due solely to *heredity*, but the cases more likely to come before us are those which are partly *inherent* and partly due to *environment*, e.g. *general paralysis*, *tabes dorsalis*.

While *syphilis*, alcohol, and debauchery play a dominant rôle in their ætiology, it is, as Hastings Gilford observes, probable that there is always some *inherited predisposition* to *nervous* affections.

The general paralytic, like the pre-ataxic tabetic, may become enrolled, and then the question may arise as to how far the responsibility of the State is engaged.

Inquiry may elicit that the subject comes of neuropathic stock, and that there is also an acquired predisposition through infection by syphilis. Moreover, if the existence of the disease be established soon after enlistment—during his training period—it may be possible also to ascertain from medical or lay sources that his condition is much the same as it was before he joined up. In such event we should, we think, be justified in affirming that the malady is partly *hereditary* and partly *acquired* and *not aggravated* by military service.

More often, however, the existence of the disease is only revealed by an efflorescence. Thus the general paralytic may suddenly develop *mania*, the pre-ataxic tabetic become *ataxic* or perhaps *blind*, and what, then, shall be our attitude? Here *aggravation* must be admitted, and for that same the State has incurred responsibility. It may be urged that, had it not been for the syphilis, the man would not have developed general paralysis or tabes. In other words, that his affliction originated in his own misconduct, and for that the State is not responsible. Nevertheless, for the aggravation that has ensued the State owes the soldier, if not a pension, at least a *gratuity*.

Fortunately cases of general paralysis or tabes are relatively rare, and we are more commonly confronted with nerve disorders —the alleged ætiology and symptomatology of which seem to predicate an *hereditary nervous irritability* or *instability*. We would be justified in assuming a case to be of this nature if there be any *marked disproportion between the intensity of the symptoms and the alleged cause thereof*. In any case presenting this peculiarity it is incumbent that we obtain as much information as possible regarding the health of the subject and his forbears.

Now, as Pearce Bailey observes, among the morbid conditions which render their victims particularly prone to transmit unstable nervous symptoms to their descendants may be mentioned alcoholism, insanity, epilepsy, syphilis, hysteria, and tuberculosis.

Accordingly we should ask: Have his forbears or relations suffered from nervous manifestations—psychoses, epilepsy, hysteria, or neurasthenia? Is there any family disposition to morbid tendencies and impulses—suicide, *alcoholism*, etc.? Is there any evidence of ancestral *tuberculosis*, either direct or collateral? as this may portend a tendency to nervous disease in the descendants, while of course the blood-relationship of the parents is an important factor.

If any of the above disorders have been present in *both* parents or have appeared to any wide extent among the *collateral* members of his family, then the presumption that the subject's nervous system is *ab initio unstable*, and therefore liable to succumb to injurious influences, is only too probable.

This assumption would be strongly reinforced if, turning to the individual himself, we find that in early life he displayed tokens of a predisposition to nervous disease—headaches, spasms, attacks of fainting (*petit mal*), vertigo, asthma, or mental disturbances—obsessions, phobias, etc. Last, but not least, we should search narrowly for any evidences of an *acquired predisposition* to nervous disorders—viz. infection by *syphilis*, or indulgence in *alcohol*, not forgetting *arteriosclerosis*.

These last-named disorders play so pre-eminent a rôle in the causation of nervous disease that it is essential we establish their presence or absence. Otherwise we are almost certain to fall into the error of attributing an *exaggerated value to the alleged exciting cause.*

For in this question of the adjudication of pensions our chief difficulty centres around cases in which the determining cause more often than not is trivial rather than severe, and yet the same is alleged as being the starting-point of functional nervous disorders.

### *Estimate of the Valency of the Alleged Exciting Cause*

To arrive at a decision we should weigh narrowly the *nature of the injuries sustained*, for slight or banal injuries of the *head* or other parts of the body may in the *alcoholic*, the *syphilitic*, or *arteriosclerotic* subject induce symptoms of disproportionate intensity as compared with those that would have ensued in a healthy person under the same conditions. Granted even trivial injuries in an " alcoholic," the symptoms presented may resemble very closely those displayed in the " traumatic neuroses." In a given case great difficulty, therefore, may be experienced in differentiating an example solely due to *trauma* and another in which the predominant rôle is played by *alcoholism*, and but secondary importance attaches to the alleged injury.

Both types of case may present *tremor*, *amblyopia*, *dulled sensibility*, and *tachycardia*; and if we are to appraise the relative responsibility of the State we must make careful search for the phenomena indicative of *chronic alcoholism.* For obviously more reliance should be placed on *objective* evidences than on the claimant's statements—e.g. facial, lingual, and general tremor, gastric irritability, dulling of the special senses, and other signs of mental degeneration.

Similarly in the case of the *syphilitic* subject injury more often trivial than severe may lead to efflorescence of the latent morbid process. Thus, how commonly does a slight blow on the head evoke nervous symptoms only too likely to be confounded with idiopathic focal lesions of the brain or the cord! Again, apart from its influence in the genesis of organic nerve diseases how often is syphilis responsible for the initiation of *functional* disorders in this same sphere!

Turning to that concomitant of old age, *arteriosclerosis*, we must recollect that it is also not rare in youth, and in *young subjects syphilis* and *alcoholism* are *prime factors* in its *causation.*

Now, as we know, even in a *non-syphilitic* individual it has

been noted by Oppenheim that in sequence to injury of the head a *cardiac* and *vasomotor neurosis* may develop, marked by *tachycardia* and *elevated blood-pressure*, which latter may eventuate ultimately in *arteriosclerosis*. If this be so in untainted subjects, how much more likely is it that such traumatism should occasion disproportionately severe symptoms—e.g. cerebral softening in a young soldier in whose arteries are already writ large the evil effects of syphilis !

So much for the method of investigating the foregoing types of cases, and now as to the formation of a decision.

We would suggest that if from analysis of the ancestral and personal history it can be shown that the claimant was *hereditarily* the possessor of an unstable nervous system and haply has reinforced that same instability by acquiring syphilis or indulgence in alcohol, we shall be justified in affirming that his nerve disorder is *hereditary*.

If then, also, it be established that the alleged cause is *banal* or *trivial* and prima facie unlikely in a normal subject to evoke a like response, we can, we think, affirm that the injury was not so much the *cause* as the *occasion* of the appearance of his nerve symptoms.

In short, we may assume that the nerve disorder is *hereditary* and *not aggravated by military service.*

If injury be not postulated as the alleged cause, but *stress* or " military hardships," we should proceed in the same manner to procure evidence as to hereditary instability. As to the question of *aggravation*, we should assume that such has *not* occurred :

(1) If from cross-examination of the previous history we are satisfied that his symptoms, as exhibited prior to enlistment, have undergone no intensification.

(2) If no fresh nervous manifestations have made their appearance.

## Other Hereditary or Constitutional Disorders

The disabilities before emphasized hamper us still in regard of other constitutional disorders—gout, diabetes, arthritis deformans, and the various forms of acute and chronic rheumatism, etc.

In all the above disorders, to establish their hereditary nature in any given case, we shall have to investigate the history of the forbears and collaterals. If evidence be forthcoming of direct transmission or of familial distribution we shall then be safe in affirming that the disorder is hereditary ; but there are certain fallacies which demand a brief digression.

Thus, needless to say, it is all-important that the diagnosis of the disorder should be accurate. *Gout*, for example, rarely develops before the thirtieth year, and consequently we should be chary in a *young* soldier of ascribing even an inflamed big-toe joint off-hand to gout. It is far more likely to be a condition of *hallux valgus* with a superadded *inflamed bunion*. The confusion of metatarsalgia, painful heel, flat-foot, and other painful static foot deformities with gout or rheumatism is incredibly common. If we should be cautious in the case of the big-toe joint, we should be even more so in respect of other joints, e.g. the knee. Such a *monarticular* affection, if not due to injury, is most likely to be due to *gonococcal* infection.

Again, fleeting pains in the limbs should not be attributed off-hand to *rheumatism* unless syphilis is excluded; similarly nomadic arthralgic pains are often of *gonococcal*, *syphilitic*, or possibly *tuberculous* nature.

If from analysis of the ancestral and personal history it can be shown that the disease is of hereditary or constitutional nature, we have still to decide whether or no it has been *aggravated* by military service.

To establish this point we should ascertain as far as possible the health of the soldier, not only from the time of, but prior to, enlistment. Has the evolution of the disease been hastened as evidenced by exacerbations or the supervention of complications? Has the gouty subject developed an acute arthritis? or the diabetic undergone rapid emaciation? If so, aggravation must be admitted.

On the other hand, if no exacerbations or complications have supervened, we may be able to affirm that, not only is his disease hereditary, but *not aggravated* by military service. This may with greater confidence be affirmed if the alleged cause or causes have not entailed an " industrial incapacity " which did not exist prior to enlistment.

But the conditions of trench warfare are so pre-eminently calculated to aggravate a constitutional disorder that only in very few instances would it be possible to assert that such has not undergone aggravation.

In drawing to a conclusion our remarks on this thorny subject we would submit that instead of the blunt interrogation: *Is the disability or infirmity constitutional or hereditary?* it would, we think, be an improvement if the question ran as follows: *What evidence, if any, is there of the disability or infirmity being constitutional or hereditary?* In this way we secure, not only the desired information, but the *data on which it is based.*

## Is the Disability attributable to or aggravated by want of Proper Care on the Man's Part—e.g. Intemperance, Misconduct, etc.

In the notes provided for the guidance of medical officers we are told in respect of this question that "information can be derived on these points from the soldier's conduct sheet and medical history sheet," and accordingly in all cases we should refer to these documents.

The phrase "want of proper care," etc., is clearly one susceptible of a very wide interpretation, and all we can do is to indicate briefly a few of the possibilities that may arise.

### *Misconduct in relation to the Circumstance of Origin of the Disability*

It may have been the outcome of horse-play with his comrades, or of his own insubordination or mutinous conduct. Or in contravention of the law that the disability—to be attributable to military service—must have arisen out of and in the course of his military duty, the said disability may have been occasioned through his drunkenness, or through his improperly meddling with that which was no part of his work.

Thus Duco and Blum state that up to 1895 no pension had been accorded to a soldier for wounds he received as the outcome of tampering with some explosive substance which he found in the house of a working tailor. They contrast this with a decision arrived at in 1916, in which a soldier received a mortal wound through his handling an unexploded grenade which he picked up in the German trenches. The casualty in this case was recognized by the authorities as having supervened in the course of military service.

Many of the questions that arise in this connexion are matters for decision by the *military authorities*, and it is for them and not for the medical officer to decide whether the impugned casualty was truly an "accident of war" or whether it arose through the man's disobedience of orders, etc.

### *Misconduct in relation to the Disability itself*

In regard of the disability itself the following possibilities must be entertained:

(1) The soldier may be guilty of *feigning* or *producing* the disability or infirmity. Thus he may wilfully maim or injure

himself or cause himself to be maimed or injured by some other person—with intent to render himself unfit for service.

(2) His disability may be *genuine*, but he may be guilty of *intentionally aggravating* the same or of protracting its cure. Thus he may wilfully disobey orders, whether in hospital or otherwise, and as a result thereof wilfully aggravate his disability —e.g. he may refuse to carry out the movements and exercises necessary for the restoration of functional efficiency in a stiff and painful shoulder.

Needless to say the medical officer should be very sure of his ground before he ventures to affirm that a disability is *feigned* or has been *intentionally produced* or *aggravated*.

By military law "the charge should show in what way a soldier has malingered, or what disease or infirmity he has feigned or produced, or what particular injury has been committed, or of what misconduct or wilful disobedience he has been guilty."

If it be a case of suspected wilful *self-maiming* "evidence will have to be given of the intent, but it will be sufficient to raise a presumption of intent if the act were shown to have been done wilfully and not accidentally."

In the matter of *feigning*: "This term means not merely that a soldier reported himself sick, but that he reported himself sick *when he knew* that he was not sick, and that he pretended or feigned certain symptoms which the medical officer was satisfied did not exist."

In a case of suspected aggravation of a disability or wilful protraction of its cure, "the misconduct must be with the intent of producing or aggravating the disease or delaying the cure as the case may be."

"The involuntary production, aggravation, or prolongation of *delirium tremens* by intemperate habits, or of venereal disease by immoral conduct, does not render a soldier liable under paragraph (3), section 18, of the Army Act." * "Nor would a soldier incur liability under it who refuses to undergo a surgical operation."

PENSION WARRANT, *April* 1917

"Clause 9. *If a man after discharge from the Army is certified to be disabled owing to:*

"(a) *Wounds or injuries received in the performance of military duty in consequence of the present war; or*

* Army Act, sec. 18, paragraph (3): "Is wilfully guilty of any misconduct, or wilfully disobeys, whether in hospital or otherwise, any orders, by means of which misconduct or disobedience he produces or aggravates disease or infirmity, or delays its cure."

"(b) *Disease, certified as contracted or commencing while on active service, or as having been aggravated by active service in consequence of the present war;*

*such disablement not having been caused or aggravated by the soldier's serious negligence or misconduct, he may be granted a pension as if he had been discharged as medically unfit for further service upon the date from which his claim is established.*"

No time limit being defined, it is clear that for many years to come, cases falling under this category will come up for judgment.

The questions that will call for solution are:

(1) *Is the disability or infirmity complained of genuine or simulated?*

(2) *Is it attributable to or aggravated by military service?*

Assuming that the existence of injury or disease has been determined, we have then the ætiological problem to confront. It may well be that the doctor of the future may have to gauge the probabilities of a direct dependence of the infirmity or disability on causes "in action" twenty-five years previously.

It would be impossible within the limits of this chapter to consider all aspects of this subject, and all we can hope to do is to take a few examples and indicate how we should arrive at a decision. It is probable that many, if not the majority, of the cases will relate to the influence of *injury. Can trauma initiate certain diseases, or aggravate their evolution when pre-existing?* The difficulties that will present themselves in these cases will vary naturally with the *time* that has elapsed since discharge from the service. It will be more useful, therefore, we take it, to consider those conditions which may ensue as a *remote* consequence of trauma.

*Pulmonary Tuberculosis.*—To take an example: A discharged soldier, the subject of pulmonary tuberculosis, affirms that the inception of such was due to an injury received by him in military service. In endeavouring to estimate the validity of his claim, attention should be paid to the following points:

(1) Was the subject's health prior to enlistment good, his occupation and surroundings such as not likely to predispose to tubercle?

(2) The nature of the injury, was it a contusion of the *chest*?

(3) Was the tuberculous lung that of the injured side? (In one or two of Mendelssohn's series it varied from two days to *two or more years.*)

Sand on this point considers that a *traumatic* origin should be conceded if pulmonary symptoms ensue not sooner than fifteen

days and not later than six months, and, finally, that *bacilli* be demonstrable in the sputum *within twelve months*. In the matter of *aggravation* of an existing phthisis we have in a previous section of this chapter dealt with the data on which to base our decision on this point.

*Cardiac Lesions.*—These may readily be attributed to long-past strain or injury. An analysis of the history is first called for, and obviously his medical *dossier* should be closely scrutinized, not only for any history of *strain* or *injury*, but also for the incidence of any *infective* disorder. This to the end of eliciting whether the man prior to enlistment was in good health or had at any time suffered from any disease likely to produce cardiac disorder.

A condition of apparently good general health prior to enlistment does not necessarily postulate a sound cardiac system. Men suffering from severe *aortic regurgitation* have to our knowledge kept at work for years without complaint.

Given that a soldier alleges that his cardiac disability dates from some strain while on military service *months* or *years* before, his *bona fides* may with justice be doubted if there be *an absence of marked hypertrophy*.

Again, a history of *rheumatic fever or syphilis* clearly inculcates caution in affiliating a cardiac lesion to *injury*. On the other hand, the ætiological relationship between the cardiac lesion and the alleged strain would be established if from the claimant's account and his medical *dossier* the following conditions were ascertained to have supervened :

(1) Onset of cardiac discomfort following *sudden* and *unusual* strain caused by the performance of a task to which the subject was unaccustomed.

(2) Aggravation of a cardiac lesion known to be *pre-existing*, such as rupture of a diseased cardiac valve or of an aneurism, during ordinary work or by a comparatively trivial effort.

(3) Cardiac discomfort severe enough to cause *immediate cessation* from work. Still the absence of the latter does not preclude a *traumatic* origin in the case of the subsequent appearance, after a variable period, of signs of a cardiac lesion, as the initial symptoms may be temporary. According to Sand, in this case for trauma to be responsible, symptoms such as tachycardia, dyspnœa should appear within *six months*, and objective signs—murmurs, cardiac enlargement—within *three years*.

(4) Following strain *immediate* onset of symptoms—cardiac discomfort, oppression, dyspnœa—associated with signs of aortic regurgitation in an individual *under forty-five* in whom acute *rheumatism* and *syphilis* are excluded. *Vague* history of injury

with *gradual* onset of symptoms in a person, the subject of syphilis or alcoholism, does not wholly preclude the influence of trauma in the shape of *accumulated lesser strains*, but it is of less value in this case.

(5) If the *site of lesion* be in the *aortic* area, association of *aortic regurgitation* with *mitral* disease would militate against *trauma*. Still more so if symptoms of *back pressure*—hepatic enlargement, œdema of the feet—were present.

The responsibility of strain in causing *cardiac dilatation* would be admitted under the following circumstances :

(1) A history of unusual hardships entailing *continuous* over-exertion.

(2) Gradual onset of cardiac distress, constant and progressive, terminating in dyspnœa, irregularity and intermittency of pulse.

(3) Signs of dilatation *unaccompanied* by those of *hypertrophy*.

### *Was a Pre-existing Cardiac Lesion aggravated by the Alleged Strain ?*

The responsibility of *trauma* in causing aggravation of a *pre-existing* cardiac lesion would be conceded under the following circumstances :

(1) Occurrence of *failure of compensation* following sudden or prolonged exertion or shock, as shown by dyspnœa, cough, dropsy, etc.

(2) Capability on the part of the subject up to enlistment to perform his usual work, but inability to do such since discharge owing to dyspnœa, cardiac pain, etc. Long-standing cardiac disorder with imminent failure of compensation would militate against a traumatic origin.

(3) *Renewed activity* or recrudescence of an *old endocardial lesion* as the result of strain.

(4) *Contraction of infection* with consequent aggravation of a *pre-existing* cardiac lesion by a soldier during his sojourn in hospital for an accident.

*Aortic Aneurism.*— Soldiers, the subjects of aortic aneurism, in older days, have been unjustly accused of simulation, but radiography has materially diminished the chances of error.

The *traumatic* origin of an aortic aneurism should be admitted if :

(1) It follows sudden or violent strain or injury.

(2) The onset of symptoms be sudden or immediate or not delayed beyond a few days.

(3) Though the *signs* of aneurism be not manifested for a *year*

*or longer*, the subject has suffered from constant or paroxysmal pains in the aortic area which have progressively increased in severity since the accident.

(4) The subject prior to enlistment had followed a laborious occupation.

(5) No more probable cause could be adduced such as *arterio-sclerosis* or *syphilis*.

Nevertheless the presence of *existing* arterial disease or a history of syphilis, though it favours the occurrence of aneurism, would not, judging from recent decisions in English courts, diminish the responsibility of the State.

### *Jacksonian Epilepsy*

Cortico-epileptic fits may follow blows or falls on the head, in most cases accompanied by fracture of the cranial bones. They may be of immediate onset or be delayed for months or years. Moreover, no interconnecting symptoms may be exhibited.

Before attributing the condition to *trauma* one should exclude the epilepsy being symptomatic of organic brain disease, neoplasms, general paralysis of the insane, nephritis, or arterio-sclerosis.

This differentiation being accomplished, the responsibility of trauma would probably be absolute if :

(1) The attacks started in the limb standing in relation to the cerebral centres involved by the injury.

(2) The spasms were more marked in this limb than the others.

(3) Operation reveals exostosis, meningitis, scars, cysts, at the site of the cranial injury.

### *Tumours*

The views held as to the rôle of trauma in the production of new growths vary considerably. Some authorities, like Ritchie, would in the great majority of cases doubt its participation in any form, while others, like Bowlby and Andrews, would admit its influence in 2 per cent. at the most of the cases. On the other hand, Wolff, among the Continental authorities, would assign it a far greater rôle, attributing to injury no less than 12 per cent. of cancers, and 20 per cent. of sarcomata. Again, Rose and Carless claim that a traumatic origin is to be met with in 7 to 14 per cent. of new growths.

As regards the ætiological significance of *chronic irritation* in the production of *epitheliomata*, the law now recognizes its influence as under the extension of Schedule III of the Workmen's

Compensation Act, epithelioma of the scrotum which occurs in chimney-sweeps, as well as epithelioma of the skin or cornea due to tar, pitch, bitumen, mineral oil, or paraffin, or any product, compound or residue of the substances, is an "industrial accident." Doubtless a similar latitude of interpretation will be accorded to a so-called "accident of war."

It now behoves us to consider the valency of trauma in the case of any neoplasm that may arise in sequence thereto. Under this heading the following questions have to be discussed :

(1) Did trauma initiate the growth ? (2) Did trauma hasten the evolution of a pre-existent growth ? (3) Did trauma in the presence of an existing growth favour the occurrence of metastasis ?

(1) *Did trauma initiate the growth ?* This question should be answered in the affirmative if the following postulates were fulfilled :

(*a*) Establishment of good health of the soldier up to the receipt of injury, and of his freedom from tumours pathologically identical with the growth imputed to injury.

(*b*) *Youthfulness* of the subject, since, save in the case of *sarcoma*, the liability to malignant growths increases with age.

(*c*) Absence of any family predisposition to growths, malignant or otherwise.

(*d*) Severity of accident sufficient to produce the common effects of injury—pain, swelling, ecchymosis.

(*e*) Existence of pain or other local symptoms connecting the injury with the subsequent growth.

(*f*) Development of the neoplasm at the site of the injury or in some organ indirectly affected by the accident.

(*g*) The site at which the injury is received, and at which the growth subsequently develops, is not one exposed to *chronic irritation.*

(*h*) The lapse of no appreciable interval between the immediate ordinary consequences of the injury and the growth of the neoplasm in the injured part.

The interval laid down by Sand between the receipt of the injury and the development of the growth in the case of *sarcoma* should not exceed three to twelve months ; in the case of *cancer* the extremes are six weeks and five years ; in the case of *glioma* a month and ten years ; while for other types of neoplasm the limits sanctioned by him are between three weeks and two years.

(2) *The hastening of the evolution of an already existing growth by trauma* should be admitted if :

(*a*) The accident had directly or indirectly provoked hæmorrhage or laceration of the substance of the growth.

(*b*) The pathological life-history of the growth were such that these contingencies were improbable in the absence of injury.

(3) The question whether *trauma in the presence of an existing growth did favour the occurrence of metastasis* is a vexed one ; but the presumption would be favoured if the primary growth had obviously taken on more rapid growth in sequence to the injury.

The obscurity that but too often enshrouds the exact ætiology of disabilities or infirmities which only become manifest or complaints of which are deferred until after discharge, is but too apparent.

To consider the myriad problems that will doubtless arise in this connexion would be impossible, and all we can hope to have achieved is an indication of the method of procedure to be followed in attempting to estimate whether or no the State's responsibility is engaged.

Obviously more than any other clause in the Warrant does this particular one lend itself to abuses of all sorts, and to this end the greatest possible care should be exercised in establishing the *bona fides* of the claimant, as otherwise it is to be feared that a repetition of the scandals perpetrated under the American Pension Scheme may find an echo in our own country.

## CHAPTER IX

# THE EVOLUTION AND GRAVITY OF THE DISABILITY OR INFIRMITY

### The Evolution of the Disability or Infirmity

MANY and divers are the fallacies that beset the medical man who would fain cast the clinical horoscope, the life-history of Disease, the mode of evolution, the end-results of Injury. Yet such is the obligation thrust upon him if he would live up to the responsibilities imposed by those particular clauses of the Royal Warrant which we are about to discuss.

Before him pass alike the diseased, the maimed, the halt, the blind—wistful, expectant that—

> old experience doth attain
> To something of prophetic strain.

Experience, the corner-stone of prognosis, is in truth his stand-by, else how can he essay his triple task—decide whether a disability or infirmity be remediable, forecast the changes that may chequer its progress, predict the manner of its ending ?

Diagnosis may be difficult, but what of Prognosis?—a step into the unknown. What clinical insight is here demanded ! Yet how silent are textbooks on this all-important point—how meagre the clinical data of experience as to the course of disease, the ultimate consequences of injury ! Well may our clinical forecasts be guarded, lest we as false prophets be held in derision. For, as Sir James Watson long since observed, much of the suspicion, reproach, and ridicule cast upon the profession has been due to the uncertainty and the variation of our hazards in this direction.

But to betake us to our task ; for, the " conditions of claim " having been fulfilled, it now devolves upon us to determine the gravity of the disability or infirmity under review and whether it demands a gratuity or a pension, either temporary or permanent.

### The Gravity of the Disability or Infirmity

To the end of eliminating arbitrary judgments and affording guidance, numerous attempts have been made in all

countries to classify disabilities or infirmities according to their gravity.

Up to the date of the present war our own efforts in this direction have been most inadequate—lagging, in this respect, far behind the comprehensive scale of gravity instituted by our French Allies as far back as 1887.

Under the French scheme all disabilities or infirmities which open a right to pension are arranged in six classes :

1*st Class.*—Blindness or total and irremediable loss of sight.

2*nd Class.*—Amputation of two limbs.

3*rd Class.*—Amputation of one limb (foot or hand).

4*th Class.*—Absolute loss of the use of two limbs, and infirmities equivalent thereto—viz. complete hemiplegia or paraplegia-polyarticular ankyloses involving upper and lower limbs, etc.

5*th Class.*—Total loss of the use of one limb and infirmities equivalent thereto—viz. incomplete hemiplegia or paraplegia, total paralysis of a limb of traumatic, rheumatic, or other origin, etc.

6*th Class.*—Reserved for less serious though still incurable disabilities.

Under the last three categories respectively a long series of infirmities regarded as equivalent in gravity thereto has been arranged. Needless to say, this renders much more easy the task of the medical assessor, though of course the list, long as it is, does not presume to be exhaustive. On the other hand, it must be recognized that the suggested classification is not free from obvious errors in its allocation to one or other category of various disabilities or infirmities—a flaw which Broca and other French experts have not been slow to recognize. To dwell upon these defects would serve no useful purpose, especially inasmuch as the French Ministry of Pensions since the onset of hostilities have, on expert advice, compiled a new "Guide Barème," in which the degrees of disablement are evaluated on the basis of civil decrees in industrial accidents of similar or allied nature. (*Vide* chapter on "Principles of Evaluation.")

Turning to our own Pension Scheme, the sole criterion that we possess for estimating the gravity of any particular disability or infirmity is that furnished by the *Schedule of Specific Injuries.* Its pronouncements, as indicated, relate almost entirely to injuries resulting in *anatomical loss*—this whether it be of a special sense-organ or of one or more limbs.

Eight categories have been defined corresponding to the degree of disablement, which ranges from 100 down to 20 per cent. No attempt, as in the French scheme, has been made to affiliate

to these different groups the disabilities or infirmities which may be regarded as equivalent in gravity thereto.

Crude losses of limbs or portions thereof constitute the major part of the suggested evaluations. No effort is made to deal with *ankyloses*—the varying degrees of disablement produced by immobilization, complete or partial, in the various joints. Nor can we fail to note the absence of any reference to the different degrees of disability imposed by *nerve lesions* of the limbs. The sole information vouchsafed in this connexion is the solitary fact that *total paralysis* is to be evaluated at 100 per cent. Practically no guidance whatever is furnished as to the evaluation of *maladies* or *diseases*, save the indefinite information that all such that involve the subject being " permanently bedridden " are assessed at 100 per cent. Also we are told that " advanced cases of incurable disease " are to be evaluated at the same figure.

These defects and omissions are the more reprehensible in view of the fact that many of the deficiencies might have been supplied had the experts concerned availed themselves of the valuable data afforded of recent years by the decrees of civil courts in the sphere of " industrial accidents."

Lastly, as we shall see when we come in a later chapter to discuss the " Principles of Evaluation," the schedule shows a lamentable lack of uniformity in its method of assessment. In other words, in some instances evaluation has manifestly been based on an *anatomical* and in others on a *functional* basis. As to the relative advantages and disadvantages of these two alternative bases of evaluation, we would refer the reader to a later chapter (" Principles of Evaluation ").*

The disabilities or infirmities in the schedule (see p. 201) forthwith entitle the victim thereof to a *permanent* pension, but they form but a tithe of those that come up for assessment, and we now proceed to discuss the principles that should guide us in determining whether or no our award should be of the nature of a gratuity or a temporary or permanent pension.

* In view of the above strictures we are glad to note that recently the Minister of Pensions, discussing the speeding-up of pensions, stated that it was proposed that all the existing regulations relating to pensions generally should be redrafted and codified, so that in the near future both the discharged men and those who have to deal with their claims shall be able to ascertain the proper pensions payable and be in a position also to solve difficulties as soon as possible.

ROYAL PENSION WARRANT (1917) FIRST SCHEDULE

*Pensions that may be granted for Specific Injuries*

| Degree of disablement | Specific injury | Proportion corresponding to degree of disablement | Disablement pension |
|---|---|---|---|
| | | Per cent. | s. d. |
| 1 | Loss of two or more limbs.<br>Loss of an arm and an eye.<br>Loss of a leg and an eye.<br>Loss of both hands or of all fingers and thumbs.<br>Loss of both feet.<br>Loss of a hand and a foot.<br>Total loss of sight.<br>Total paralysis.<br>Lunacy.<br>Wounds, injuries, or disease resulting in disabled man being permanently bedridden.<br>Wounds of or injuries to internal, thoracic, or abdominal organs involving total permanent disabling effects.<br>Wounds of or injuries to head or brain involving total permanent disabling effects or Jacksonian epilepsy.<br>Very severe facial disfigurement.<br>Advanced cases of incurable disease. | 100 | 27 6 |
| 2 | Amputation of leg at hip or right arm at shoulder-joint.*<br>Severe facial disfigurement.<br>Total loss of speech. | 80 | 22 0 |
| 3 | Short thigh amputation of leg with pelvic band, or of left arm at shoulder-joint, or of right arm above or through elbow.<br>Total deafness. | 70 | 19 3 |
| 4 | Amputation of leg above knee (other than 3) and through knee, or of left arm above or through elbow, or of right arm below elbow. | 60 | 16 6 |
| 5 | Amputation of leg below knee (including Symes' and Chopart's amputation), or of left arm below elbow.<br>Loss of vision of one eye. | 50 | 13 9 |
| 6 | Loss of thumb or of four fingers of right hand. | 40 | 11 0 |
| 7 | Loss of thumb or of four fingers of left hand, or of three fingers of right hand. | 30 | 8 3 |
| 8 | Loss of two fingers of either hand. | 20 | 5 6 |

NOTE.—In the case of left-handed men, certified to be such, the compensation in respect of the left arm, hand, etc., will be as for a right arm, hand, etc., and vice versa.

* In the First Schedule of the Royal Pension Warrant of 1918 the proportion

## THE GRATUITY

"7. (1) *In any case where the degree of disablement is assessed at less than* 20 *per cent., or where it is considered more in the interests of the soldier, a gratuity or temporary allowance may be granted in place of any pension and children's allowance. The grant will be subject to such conditions as the Minister of Pensions may determine, and its amount will not exceed* £200 *and will depend on the extent of the disablement and on the other circumstances of the case.*

"(2) *A soldier discharged as medically unfit for further service—such unfitness being neither attributable to nor aggravated by military service, and not being due to the serious negligence or misconduct of the discharged man, may be granted a gratuity or temporary allowance. The grant will be subject to such conditions as the Minister of Pensions may determine. In exceptional circumstances it may amount to a sum not exceeding* £150, *and generally it will depend on the extent to which the man is incapacitated, on the length and character of his service, and on the other circumstances of the case.*"—Pension Warrant, 1917.

Opinion has it that States, like all corporate bodies, have no soul, no bowels of compassion, but the institution of gratuities belies the current axiom. Their installation dates from the dawn of military legislation, and doubtless even in those far-off days men's minds, as now, were often exercised as to whether their obligations ceased with the repayment of services or whether, in addition, some expression of gratitude, "the least of virtues," was demanded of them.

Good King George, it will be recalled, with the view of rewarding meritorious soldiers when discharged, was pleased to direct that in addition to their pension a *gratuity* should be awarded them. It is this human note, this quality of spontaneity, that *au fond* distinguishes a gratuity from a pension.

Thus in legal parlance runs its definition: "a faculty, licence, or dispensation bestowed by legal authority, the granting of which rests in discretion or favour and is not to be asked as of right."

In other words, a gratuity is a free gift, or, as the French term it, *une concession gracieuse*—that which is given without claim or demand.

In further contradistinction from the pension, its benefits are:

of disablement resulting from loss of right arm at shoulder joint has been assessed at 90 per cent., and the disablement pension raised to 24s. 9d. In the left a similar loss is rated at 80 per cent., with a disablement pension of 22s. (*Vide* chapter on "Amputations" for complete Schedule as laid down in the Royal Warrant of 1918.)

(1) limited to the recipients ; (2) do not revert to widows, children, or dependents ; and, lastly, once granted it cannot suffer reduction.

A few examples as to the type of case in which gratuities have been awarded—viz. whose disability or infirmity has been assessed at below 20 per cent.—may be of use, as a guide.*

C. W., fireman, *æt.* 39. He sustained a wound of the face entailing loss of the canine, premolars, and first molar on right side. Supplied with false teeth, he can now masticate efficiently and suffers little from his wound, if at all ; but in view of his actual loss of tissue he was awarded a gratuity—i.e. his injury was assessed at less than 20 per cent.

W. S., miner, *æt.* 45. Prior to his entry into the Service he had a hernia which was easily controlled by a truss. Since war service the truss has sometimes not obviated its descent. Assessed at less than 20 per cent.

J. W., designer, *æt.* 42. He admits to a " rheumatic " history, but had incurred no previous cardiac disorder. He now suffers from tachycardia and irregular action of the heart, which, however, does not cause him any special distress. Assessed at less than 20 per cent.

D. W., miner, *æt.* 43. States that he acquired rheumatism in the trenches—not having had any such trouble before and having always been able to " work at the face." Since discharge, however, has not done so owing to pain in the back. No objective signs of rheumatism discernible, but his inability to " work at face " confirmed. Assessed at less than 20 per cent.

## THE TEMPORARY PENSION

" *In the case of a man whose disablement has not reached its final condition a pension may be temporarily granted at the rate appropriate to his temporary disablement, and the grant shall be reviewed from time to time until a permanent assessment can be made.*"—Pension Warrant, 1917, clause 5 (1).†

As the wording of the above clause connotes, the term " temporary " or " conditional " pension implies that the soldier shall be liable to occasional examination. In other words, the bounty of Government is not intended to be allowed for a longer period than the actual existence of the disability or infirmity which disqualified the soldier for the Service and entailed his discharge therefrom.

* At a recent meeting of the Executive Committee of the Parliamentary War Pensions Bureau, the Minister of Pensions, in regard to gratuities, made it quite clear that any man had the right of appeal if he considered he was eligible for a *pension*. He remarked, however, that in future there would be very few gratuities awarded on a man being discharged, and it was proposed to substitute a payment of temporary allowances instead.

† " Except in those cases where the disablement has reached its final condition a disablement pension shall be temporary, at the rate appropriate to the temporary disablement, and the grant shall be reviewed from time to time until a permanent assessment can be made or the grant ceases. Where a temporary disablement pension, including renewals, does not run beyond one year a supplementary gratuity of £5 may be granted at the termination of such pension." —Pension Warrant, 1918, clause 1 (2).

The grant, we are told, "shall be reviewed from time to time until a permanent assessment can be made," wherein we catch an echo, as it were, of the procedure adopted in "industrial accidents." For under the Compensation laws it was decreed that the amount should be amenable to *revision*—the re-assessment having for its end the increase, diminution, or abolition of the monetary allowance according to the subject's condition.* We see, therefore, that both in the matter of *pensions* and *compensation* the military and civil authorities have, to obviate rash or premature decisions by the medical man, allotted him the power of reserving his opinion or of reconsidering any judgment he may have given. Moreover, this latitude in the matter of *revisional* examinations enables him more accurately to estimate the actual degree of the damage that the victim, whether soldier or industrial worker, has sustained.

## Conditions Qualifying for Temporary Pensions

The clinical entities falling into this category constitute a group of disabilities or infirmities intermediate between those eligible for *gratuities* and those graver instances which by Royal Warrant are forthwith admissible to *permanent pension.* Put otherwise, all those morbid states which are *assessed at or above* 20 *per cent. and which do not figure in the Schedule of Specific Injuries* should, pending the formation of a final decision as to their curability or incurability, be placed on *temporary* pension.

The disabled soldier while on *temporary* pension and alike the injured workman receiving *weekly payments* rest *sub judice*—a wise precaution in view of the pitfalls that beset diagnosis and still more prognosis. This power of suspending judgment is very clearly laid down in Article 1162, Royal Warrant, 1914: "*Should the evidence procurable at the time of the man's discharge not be sufficient to prove to the satisfaction of Our Commissioners of Chelsea Hospital that the disability is a permanent one, the pension shall be granted temporarily, and shall not be made permanent unless the permanence of the disability is established.*"

* Workmen's Compensation Act, Schedule I, clause 15: "Any weekly payment may be reviewed at the request either of the employer or of the workman, and on such review may be ended, diminished, or increased subject to the maximum above provided, and the amount of payment shall, in default of agreement, be settled by arbitration under this Act. Provided that when the workman was at the date of the accident under twenty-one years of age and the review takes place more than twelve months after the accident, the amount of the weekly payment may be increased to any amount not exceeding 50 per cent. of the weekly sum which the workman would probably have been earning at the date of the review if he had remained uninjured, but not in any case exceeding one pound."

### The Need for Caution

It should always be borne in mind that, excluding the Schedule of Specific Injuries, the Pension Warrant endows us with considerable discretionary powers. We are in no way compelled to a hasty decision, and this luckily, for oftentimes provisional rather than absolute diagnosis is all that is attainable. Needless to say, too, that when such doubts obtain as to the nature of the case it is, of course, impossible to decide off-hand whether the morbid state or disability is *permanent* or *temporary*, *curable* or *incurable*.

Especially true is this of certain affections such as pulmonary tuberculosis, neurasthenia, functional nerve disorders, lesions of the nerves, articulations, etc. How difficult, nay impossible, in the first few months to decide whether they are or are not curable ! In presence of this alternative one should withhold judgment and not be betrayed into rash decisions in either direction. Pending the lapse of a sufficient interval—one adequate for the formation of a definite decision—the exigencies of the case will be met by a *temporary* pension.

If this prudent course were adopted it would do much to remove that bane of all pension schemes from time immemorial—viz. the retention on *permanent* pension of men who in a few months or years have wholly recovered their health and working capacity. The need for circumspection is the more obvious when we recall that the majority of claimants for pension are in the heyday of youth—the period in which the recuperative powers are more likely to be *over-* than under-estimated.

*Revisional examination* is the only means whereby such errors of judgment can be obviated, and, fortunately, both civil and military legislation afford us this necessary means of verifying or correcting faulty diagnoses or prognoses. In no sphere of disease or disability is its usefulness more clearly displayed than in *disorders of the articulations*.

To take an example, *osseous ankylosis*, if demonstrable by skiagraphy, carries with it the right to *permanent* pension from the moment of its recognition as such. On the other hand, *fibrous* ankylosis, by reason of the uncertainty of its *dénouement*, calls for suspended judgment. Its curability or incurability cannot be affirmed until the results of treatment can be estimated. This, of course, involves the lapse of a period of time sufficient to enable us to ascertain how far the desired functional restoration is realizable—hence meanwhile the fitness of the subject for a *temporary* pension.

In the awarding of pensions the greatest care must be taken, especially in the *shoulder*, not to confound *ankylosis* with mere

*limitation of movement*, as in the latter instance increased amplitude of mobility fortunately often ensues, and this to an unexpected degree. Wounds in the neighbourhood of the shoulder, given suppuration and prolonged immobilization, may leave a condition closely simulating *total ankylosis*. Duco and Blum cite an instance in which, on the basis of such a diagnostic error, the subject was held entitled to a permanent pension. Nevertheless, when subjected to another examination many months subsequently, it transpired that there was no ankylosis, but simply *articular stiffness with limitation of movement*.

Or the reverse may happen. Thus a condition deemed susceptible of cure and placed accordingly on temporary allowance may later, through some unforeseen contingency, become eligible for permanent pension. For example, a fracture deemed at first to be unconsolidated through *delayed* union may, after the lapse of an adequate period, on re-examination be found the seat of a definite and incurable *pseudarthrosis*.

Duco and Blum more than all others have emphasized the danger of *premature* proposal of disabled soldiers for *permanent* pensions. With admirable candour, they have not hesitated to compile a list of instances illustrative of the need for caution and the necessity for revisional examinations. This table (see p. 207) we take the liberty of transcribing, and, lest we plume ourselves on immunity from such errors, we would remind the reader that our countryman, Marshall, has but too clearly shown that our remissness in this direction has been equally pronounced.

As to the *duration* of a pension as *temporary*, no arbitrary limits are fixed. It may be safely affirmed that *no disability or infirmity susceptible of disappearance with the passage of time should be placed on permanent pension*. "The grant shall be reviewed from time to time until a permanent assessment can be made"—thus runs the pertinent clause of the Pension Warrant. Its significance for our purpose is more clearly expressed in Article 1167 of the Royal Warrant, 1914, which decrees that a temporary grant shall be renewed until the disability or infirmity can be established as *permanent* in nature.

"*If, after the expiration of the term for which a temporary pension has been granted, the disability continues to lessen the power of the pensioner to earn a full livelihood, the grant may be renewed for a further term, or should this incapacity be shown by competent medical opinion to be permanent in its nature from the same cause, a permanent pension may be awarded, with reference to the character of the pensioner.*"

In the matter of *injured workmen in receipt of weekly payments* as compensation for an "industrial accident," the

| | Diagnosis | Revised diagnosis |
|---|---|---|
| Fracture of right leg; 3 cm. of shortening; vicious alinement of limb. | Pension 5th class. No. 58. | No shortening; no vicious deviation; functional disability of 4–5 per cent. |
| Total loss of vision in right eye; diminished visual acuity in left. | Pension 5th class. No. 21. | Normal vision; fit for service. |
| Fracture of skull; double optic atrophy. | 80 per cent. Discharge. | No fracture of skull; no ocular troubles; fit for service. |
| Bilateral deafness through shell-shock. | Pension 5th class. | Fit for service. |
| Ankylosis of right elbow: radial paralysis. | 60 per cent. Discharge. | No ankylosis; no paralysis; fit for service. |
| Extensive eventration of abdominal wall; not amenable to intervention. | 20 per cent. | Pension 5th class. No. 35. |
| Depressed fracture of frontal bone. | Pension 5th class. No. 17. | Depressed cicatrix of frontal region. 20 per cent. |
| Excessive callus-formation after fracture of both malleoli. | Pension 6th class. No. 58. | Sprain of ankle without fracture, with slight limping of intermittent nature. 10 per cent. |
| Amputation of right thumb. | 20 per cent. | Pension 6th class No. 64. |
| Amputation of left thumb. | Pension 6th class. | Amputation of thumb at middle of first phalanx. 20 per cent. |
| Pseudarthrosis of inferior maxilla. | 20 per cent. | Pension 5th class. No. 23. |
| Ankylosis of knee. | 40 per cent. | Attitude voluntarily assumed. 0 per cent. |
| Stricture of gullet. | 40 per cent. | No lesion. 0 per cent. |
| Loss of use of two lower limbs. | 80 per cent. | No lesion. |
| Fracture of femoral condyles; ankylosis of right knee. | Pension 6th class. | No fracture; no ankylosis. 0 per cent. |
| Cicatrix after trephining; considerable diminution of vision in left eye; cicatrices at level of upper jaw; partial ankylosis of maxillary joint. | Pension 4th class. | No loss of bony structure; vision normal; maxillary sinusites deficient. 20 per cent. |
| Impotence of left lower limb. | 60 per cent. | Simulation. 0 per cent. |
| Pulmonary tuberculosis. | Pension 5th class. | Weakness without lesion. 20 per cent. |
| Fracture of hip-bone. | Pension 6th class. | Insignificant lesion of iliac bone; reflex contracture. 10 per cent. |
| Ablation of the medius; chronic bronchitis. | 50 per cent. | No bronchitis. 5 per cent. |
| Right hemianopsia. | 30 per cent. | No hemianopsia. 0 per cent. |

discontinuance of the same or not must be decided according to the following decrees :

" An award permanently ending payments may be, and as a general rule ought to be (*Husband* v. *Campbell*, 1903, 40 S.L.R. 822), made when the workman has fully recovered from the effects of the accident without any likelihood of their recurrence (*London and N.W.R. Co.* v. *Taylor*, 1910, 4 B.W.C.C. 11 ; affirmed 1912, A.C. 242, 5 B.W.C.C. 218) or where the subsequent developments have no connexion with the accident (*Hargreave* v. *Haughhead Coal Co. Ltd.*, 1912, A.C. 319, 5 B.W.C.C. 445), but not where the arbitrator finds the possibility of future incapacity and ignores it on the ground that it can be prevented by an operation (*Braithwaite* v. *Kirk and Cox*, 1911, 5 B.W.C.C. 77)."

## THE PERMANENT PENSIONS

" 5. (2) *When a permanent pension has been granted it shall not be altered on account of any change in the man's earning capacity, whether resulting from training or other cause ; neither shall it be subject to review except—*

" (*a*) *When a man whose pension is assessed under Article* 1 *of this Our Warrant claims that there has been a substantial increase in the extent of the disablement due to the original cause.*

" (*b*) *When a man whose pension is assessed under Articles* 1 *and* 2 *of this Our Warrant shows that it would be more advantageous to him to be assessed under Article* 3."—Pension Warrant, 1917, clause 5 (2).*

It needs but little insight to discern that the successful administration of the pension scheme is intimately bound up with the interpretation accorded the two clauses relating to temporary and permanent pensions.

* " 5. (1) When a permanent pension has been granted it shall not be altered on account of any change in the man's earning capacity, whether resulting from training or other cause ; neither shall it be subject to review except :

" (*a*) When a man whose pension is assessed under Article 1 of this Our Warrant claims that there has been a substantial increase in the extent of the disablement due to the original cause.

" (*b*) When a man whose pension is assessed under Article 1 of this Our Warrant shows that it would be more advantageous to him to be assessed under Article 3 : provided that the cessation or reduction of any allowance under Article 2 of this Our Warrant shall not be a ground for review.

" (*c*) Under the following subsection.

" (2) The Minister of Pensions may at any time order the review of any pension in any case where :

" (*a*) A pension has, by error in interpretation or fact, been granted to a disabled man in excess of the amount appropriate to the degree of his disablement ;

" (*b*) The Minister of Pensions has reason to believe that a pension has been obtained by any improper means ; or

" (*c*) A pension has been granted by error."—Pension Warrant, 1918, clause 5 (1) and (2).

From our own experience we must confess to misgivings, as the pronouncements offer no little scope for misconception and this of varied sort. Our apprehensions, too, on this score are but reinforced when we have regard to the ambiguous wording of the questions—designed presumably to elucidate the salient point at issue—viz. the *permanency* or not of the alleged disability. Thus in Army Form A $\frac{36}{C}$, used for re-examination of a discharged soldier to determine his claim to a further grant of pension, the following demand is made of the medical officer: "Is the disability *permanent*? If so, *will it materially improve or get worse?*"

### *Misapplication of the Term Permanent*

Without savour of pedantry it may be affirmed that the wording of this interrogation is most unhappy, not to say self-contradictory. The question, in truth, seems calculated to befog rather than illumine the point at issue.

In light of this it seems necessary to recall that the word "permanent" signifies "continuing or designed to continue indefinitely without change, abiding, lasting, enduring, persistent as opposed to temporary."

In other words, the term *permanent* is, strictly speaking, applicable to a disability or infirmity only when the same is *immutable*—when, clinically speaking, it has, to quote the words of the Warrant, "reached its final condition."

Notwithstanding, we are asked: "Is the disability *permanent*?" and this being granted, the further demand: "*Will it materially improve or get worse?*"

Now, though even then straining the meaning of the word permanent, it may provisionally be admitted that a disability, even though of *permanent* nature, may "get worse." Indeed the Royal Warrant makes provision for this contingency in sub-clause (*a*). But it, rightly, does not envisage the reverse possibility—that a permanent disability may "materially improve." Clearly in this eventuality the term *permanent* is inapplicable, for any disability or infirmity which is capable of material improvement *ipso facto* has not "reached its final condition," and pending that has no title to be held as permanent in nature.

We have ventured upon this criticism inasmuch as laxity of interpretation of this word "permanent," especially if it connote application of the term to conditions capable of material improvement, must necessarily lead to ineligible cases being placed upon *permanent* pension. For, obviously, disabilities or infirmities in which *improvement* is possible should, until these

powers of amelioration are exhausted, be retained on *temporary* pension.

May we take the further liberty of suggesting the propriety of formulating the question as follows: "Is the disability permanent, *or* will it materially improve or get worse?"

### *Legal Interpretations accorded the Term "Permanent"*

"Incapacity, whether total or partial, means incapacity for work, and it is *permanent* when the workman's physical condition is *stable*." As the Master of the Rolls observes, "the great difficulty is as to the meaning of the word 'permanent.' In reviewing a weekly payment under Clause 16 * the arbitrator must deal only with existing facts and must not prophesy or speculate as to the workman's future condition."

But it is interesting to note that there are reservations to this opinion—viz. in case of a *redemption of the weekly payment by a lump sum.* In this instance "the arbitrator must speculate." "He must not rest content with finding that the weekly payment which has been continued for six months is at the moment the proper sum. He must start with the assumption that the existing weekly payment is proper; but he must go further and ascertain as best he can whether that payment is likely to be proper during the rest of the man's life. *Is his condition stable, or is there a*

* "Any weekly payment may be reviewed at the request either of the employer or of the workman, and on such review may be ended, diminished, or increased, subject to the maximum above provided, and the amount of payment shall, in default of agreement, be settled by arbitration under this Act:

"Provided that where the workman was at the date of the accident under twenty-one years of age and the review take place more than twelve months after the accident, the amount of the weekly payment may be increased to any amount not exceeding 50 per cent. of the weekly sum which the workman would probably have been earning at the date of the review if he had remained uninjured, but not in any case exceeding one pound."—Workmen's Compensation Act, Schedule I, clause 16.

"Where any weekly payment has been continued for not less than six months, the liability therefor may, on application by or on behalf of the employer, be redeemed by the payment of a lump sum of such an amount as, where the incapacity is permanent, would, if invested in the purchase of an immediate life annuity from the National Debt Commissioners through the Post Office Savings Bank, purchase an annuity for the workman equal to 75 per cent. of the annual value of the weekly payment, and as in any other case may be settled by arbitration under this Act, and such lump sum may be ordered by the committee or arbitrator or judge of the county court to be invested or otherwise applied for the benefit of the person entitled thereto: Provided that nothing in this paragraph shall be construed as preventing agreements being made for the redemption of a weekly payment by a lump sum."—Workmen's Compensation Act, Schedule I, clause 17.

*probability that he will get better or worse?* If his condition is *stable*, the incapacity is *permanent* within the meaning of the clause." (1912, 1 K.B., p. 97, per Cozens-Hardy, Master of Rolls.) (Italics are ours.)

## Fixation of a Pension as Permanent

The first duty of the medical man is to ascertain whether the disability or infirmity under review has "reached its final condition." We invoke the exact words of the Warrant advisedly, for obviously much depends on the meaning we accord to the term "final." But whatever our interpretation, we may rest assured that no disability or infirmity which may materially improve or get worse can be said to have "reached its final condition." Neither, may we add, is any condition fraught with these potentialities one eligible for *permanent* pension; for clearly its evolution, its life-history, is incomplete, the *time is not ripe for its reassessment.*

On the other hand, if such potentialities denote *non-arrival* at a *final* condition, on what criteria are we to base the attainment thereof.

A disability may be said to have "reached its final condition" when not only is *anatomical repair* accomplished, but *functional restoration, with its correlated adaptation, has reached its acme of attainment.* (*Vide* chapter on "Functional Adaptation.")

As we shall see when discussing adaptation, *permanency of lesion* does not necessarily predicate *permanency of disability*—this not even in the presence of *anatomical loss.* Hence our claim that the innate capacities for *functional adaptation to the consequences of injury* must be exhausted before we can claim that a disability has "reached its final condition." We are fortified in this contention by recent legal findings.

"The Court of Session, by a majority, held that an arbitrator did not exceed his powers when he awarded a one-armed man a lump sum on the footing of permanent incapacity without inquiring whether he was capable of working or earning anything (*National Telephone Co. Ltd.* v. *Smith*, 1909, 46 S.L.R. 988, 2 B.W.C.C. 417); but the Court of Appeal in England have disagreed with this decision. In their view a preliminary inquiry must be made in order to ascertain whether the incapacity will continue during the remainder of the workman's life, and before an award based on permanent incapacity can be made there must be evidence that such incapacity is permanent (*Staveley Coal and Iron Co.* v. *Elson*, 1912, 5 B.W.C.C. 301)."

The pronouncement of the Court of Appeal clearly indicates

the impropriety of premature fixation of a *pension* as *permanent*. In other words, a pension should not be *fixed as permanent until* the *measure of the residual functional or earning capacity* can be gauged. This cannot be established pending the exhaustion, not only of all methods of treatment, but of all the innate capacities for *functional adaptation* possessed by the individual.

It is precisely this error into which the Pension authorities have fallen in formulating their Schedule of Specific Injuries, which *forthwith* entitle the victims thereof to a *permanent* pension. They assume, not only that the incapacity of the disabled soldier will continue during the remainder of his life, but more—that the measure of this incapacity will be the *same* for all soldiers, the victims of a similar lesion. Both assumptions are unauthorized for both are premature, but to this point we shall return when discussing the principles of evaluation.

To sum up, the primary feature qualifying a disability or infirmity for permanent pension is that it be *permanent* or *stable*, i.e. " has reached its final condition." But the provisions of the Royal Warrant are such that this dictum as to stability or permanency is subject to certain reservations, to the discussion of which we now proceed.

### *Gravity and Incurability*

Given that a disability or infirmity is *stable* or *permanent* in nature, it does not necessarily follow that it is eligible for permanent pension within the meaning of the Warrant. We have to consider, moreover, its gravity and its incurability.

In regard of these further postulates it may be laid down that the only disabilities which *forthwith entitle to permanent pension* are *those specific injuries comprised under Schedule* 1.

Conversely, the only disabilities which can *forthwith* be ruled out as *ineligible for permanent pension* are those assessed at under 20 per cent.

In between these two groups—one qualified and the other disqualified for permanent pension—we shall find ample scope for our discretionary powers.

To begin with, a disability or infirmity may be very grave, may totally disable a man (up to 100 per cent.)—in short, may exceed in gravity many of the scheduled injuries—but may nevertheless be ineligible for *permanent* pension. This for the reason that it is *not incurable*. Thus, for example, a man may be the victim of *double cataract*, reducing his visual acuity to mere perception of light ; or he may be the subject of *functional paraplegia*. Both these affections are *curable*.

Conversely, there are numerous infirmities which, although

*incurable*, are in their nature of *insufficient gravity* to justify permanent pension—viz. all those that are assessed at below 20 per cent.

We see, therefore, that the three postulates that must be fulfilled, or that qualify for permanent pension, are as follows: the disability or infirmity must be *permanent or stable, of a certain gravity*, and *incurable*.

### *Necessity of Caution in assuming Incurability*

It will exercise a chastening influence if we recall that a pension, *once made permanent*, cannot be altered—*despite any decrease in the measure of the disablement*—save except by *special intervention of the Minister of Pensions*. This discretionary power was not vested in the Minister until the passing of the Royal Warrant of 1918. Prior to this date—viz. under the Warrant of 1917—the necessity of caution in assuming *Incurability* was infinitely more imperative. For at that time if, after granting a *permanent* pension, it subsequently transpired that we had *over-estimated the degree or duration of the man's disability* there was no means of redress, no power of revising the decision. In other words, the pension, once made permanent, was irrevocable even though based on a palpable error of diagnosis or prognosis. Indeed, more, it was doubtful if it could be diminished or withdrawn even though the disability proved to have been *simulated*. But possibly in this event the provisions still in force for *forfeiture* of pension might have been invoked.*

The pensioner, it is true, might put in a claim for reassessment if there had ensued "a substantial *increase* in the extent of the disablement due to the original cause." But suppose the reverse had occurred—viz. a substantial *decrease* in the extent of the disablement due to the original cause—*there was no power of revision* (up to the passing of the Royal Warrant of 1918).

But notwithstanding the fact that it rests within the power of the Minister of Pensions to, at any time, order the review of any pension in any case, this same does not absolve us from the duty of exercising the greatest caution in assuming *incurability* and, according to the gravity of the disability, its correlated eligibility for permanent pension.

We must recollect that *premature* or *erroneous* fixation of a

* "1208. A pensioner shall be subject to forfeiture of pension under the following circumstances: (*a*) For wilfully obtaining credit for more than his actual service by means of false entries, alterations, or erasures in regimental books, documents, or parchment certificates; or *by any misrepresentation of his real claims*."

pension as *permanent* is derogatory to the prestige of the medical profession. Moreover, it entails diminished administrative efficiency of the pension system, and incidentally is an added source of expense to the State.

Duco and Blum, in their admirable advice to military medico-legal experts, issue a strong caveat against the flippant assumption of incurability. They urge upon all medical men the importance of realizing that, given incurability with its associated permanent pension, the following liabilities are incurred by the State :

(1) A pension once accorded by the Ministry is for life, and reverts to the widow and orphans.

(2) Even if, on the basis of an erroneous diagnosis or prognosis, the pension has been granted, and even if after it transpire that the disability or infirmity was *simulated*, the State has no appeal —the pension rests acquired.

They urge, therefore, that before assuming incurability all scientific means should be taken to ascertain that the disability or infirmity is genuinely permanent beyond the pale of amelioration.

In like manner, too, we would urge upon the profession that our responsibility to the State in this matter of fixation of a pension as permanent is most onerous. *Permanency of pension spells, or should spell, permanency of disability.* In other words, the pension is for life, the disability should also endure for the same period.

### *Fallacies to be avoided*

Hasty and ill-considered judgments as to incurability have from time immemorial proved the bane of pension schemes in all countries, including our own. Writing in 1839 on " The Pensioning of Soldiers," Marshall observes : " It would appear that a considerable portion of the Chelsea pensioners do not labour under disabling infirmities. Of about 26,000 pensioners that were in Ireland in 1828, 6000 were, upon examination, found fit for service in the field or in a garrison ; and when the pensioners who receive less than one shilling per day in Great Britain were examined early in 1841, from one-third to one-half of the whole number were found fit for military duty. In one station, of 1300 pensioners which were inspected, 600 were returned fit for duty. The most surprising recoveries had taken place. Men who had been discharged as blind were restored to sight, the deaf heard, and the lame ceased to halt."

With all the arrogance of a later date we may perhaps assume that in our more enlightened days such mistakes would not have

occurred. It is easy to be wise after the event—to affirm that the blind who afterwards saw, the deaf who anon heard, and the paralysed who took up his bed and walked, were but the victims of *functional* disorders. But it is premature to plume ourselves on having escaped these pitfalls—to affirm that we have let no case of this nature pass on to *permanent* pension.

French physicians—than whom none better—have had the courage to admit that in the opening years of the war not one, but a considerable number of instances of *hysterical paralysis* were proposed for *permanent* pension. The intricacy of the problem presented by these cases is only now being adequately recognized—the absolute necessity of their being judged by *neurologists* as fit or not fit for *permanent* pension. In these neuroses and psychoneuroses the passage of a sufficient interval of time is a *sine qua non* before venturing to affirm their incurability.

Especially careful should we be in all instances of *functional paralysis* or *contractures* that have ensued consecutively to *wounds* or *traumatisms* of the limbs. Certainly, too, should we be mindful that we allow no unguarded expressions as to their *permanency* to escape us in the subject's presence, for such often exert a pernicious effect, prolonging the period of incapacity. Moreover, false hopes are engendered, and when later examination reveals a striking diminution in his disabilities the decrease in his pension evokes no little discontent.

Again, in *nerve lesions* recovery is slow—a matter of *months* or even *years*. Thus Sherren remarks that "in primary suture of one of the nerves of the forearm muscular recovery does not begin under nine months, and perfect sensory restoration is not to be expected under three years."

Duco and Blum, again, state that in nerve lesions of only a few months' standing, even if the reaction of *total degeneration* be elicited, their *incurability must not be too hastily affirmed*, as many such cases have wholly recovered. It is but prudent, therefore, to keep such cases under observation for eighteen months to two years, testing frequently the electrical reactions, before we arrive at a decision as to their incurability. One should be even more careful in instances of *secondary suture*, in which recovery is much slower.

Here one may remark on the wonderful manner in which after secondary suture *trophic ulceration* undergoes cure. For, as Sherren and Head have pointed out, cure without fear of recurrence is assured on the restoration of *protopathic* sensibility—which latter is almost certain of achievement by operation.

Similarly in *ankyloses*—before we conclude that it is *osseous*

in nature we should certainly invoke the opinion of a skilled radiographer. Appearances are often deceptive, and the uninitiated are only too likely to interpret the radiograph incorrectly. Thus the skiagraph of a knee, if taken in a position of incomplete extension, gives the appearance of obliteration of the inter-articular space, and is, therefore, readily confused with ankylosis. Needless to say, too, one should be careful to distinguish stiffness through *lack of exercise, prolonged immobilization*, and, last but not least, those complex instances of *hystero-traumatic* nature.

Turning to the sphere of *disease*, we should beware of rash decisions—only placing the subject on *permanent* pension when we have definite objective evidence of the incurability of the disorder.

Thus, for example, if it be a case of *chronic bronchitis* we should not forthwith place the subject on *permanent* pension; but this would be indicated if the disorder were associated with marked *emphysema, cardiac* or *renal* disease. Again, if it be a case of *pulmonary tuberculosis* such does not necessarily entitle to permanent pension unless the morbid process is advanced and marked by incurable lesions.

In *valvular heart disease* we should not be obsessed by the *local* lesion, but should recollect that the prognosis depends ultimately on the *myocardial capacity*. Is this latter capable or not of meeting the increased strain thrown upon it by the valvular disability? If there are phenomena that point to *exhaustion* of *ventricular contractility*—viz. cardiac pain, dyspnœa, and œdema—then a permanent pension is clearly indicated.

Similarly, in the sphere of compensation for *industrial accidents*, if redemption of weekly payments by a lump sum be proposed, the first duty of the arbitrator is to ascertain whether or not the *incapacity is permanent*.* In arriving at a decision on this point "the arbitrator must act strictly on the evidence before him. He ought not to have regard to his personal know-

* Workmen's Compensation Act, Redemption of Weekly Payments, Schedule I, clause 17: "Where any weekly payment has been continued for not less than six months the liability therefor may, on application by or on behalf of the employer, be redeemed by the payment of a lump sum of such an amount as, where the incapacity is permanent, would, if invested in the purchase of an immediate life annuity from the National Debt Commissioners through the Post Office Savings Bank, purchase an annuity for the workman equal to 75 per cent. of the annual value of the weekly payment, and, as in any other case, may be settled by arbitration under this Act, and such lump sum may be ordered by the Committee or arbitrator or judge of the county court to be invested or otherwise applied for the benefit of the person entitled thereto: Provided that nothing in this paragraph shall be construed as preventing agreements being made for the redemption of a weekly payment by a lump sum."

ledge gleaned from other cases which he has heard, and it is doubtful whether he ought to admit as evidence the statement of a witness called to show how prosperous he has been notwithstanding he is suffering from a deformity similar to the one under discussion." (*Calico Printers' Association* v. *Booth*, 1913, 29 T.L.R. 664, 6 B.W.C.C. 556.)

## REFUSAL OF TREATMENT

Some one—we believe Carlyle—once observed that liberty consists in the inalienable right of every man to go to the devil after his own fashion. Put less crudely, every individual has certain " rights "—hence the saying that a man " may do what he likes with his own," and particularly so in what touches his own body.

*Legally* he may, even in his own despite, refuse to submit to a prescribed treatment, a suggested operation; but *morally* he is under this obligation—that he must exercise his right of refusal for the general good. In other words, so long as the consequences of his refusal are delimited to himself he is within his rights, but not so if others are involved—if his action runs counter to the weal of the community of which he is an integral unit.

Far too commonly the individual forgets that the term " rights " and " obligations " are strictly correlative. Every " right " brings with it an " obligation "; but while a man's " rights " are generally secured to him by law, it is, unfortunately, generally found inconvenient to enforce his corresponding " obligations."

It is because this thorny question of refusal of treatment is so pre-eminently one of individual " rights " and " moral obligations " that we have ventured on these prefatory remarks.

The law has it that no man can be compelled to submit to such and such treatment, or this or that surgical operation; but it reserves to itself the right to decide whether such refusal is *reasonable* or unreasonable.

### Is the Refusal Reasonable or Unreasonable?

To establish the point at issue it is necessary that we consider the nature of (1) the motive, (2) the treatment prescribed, (3) the operation advised.

#### *The Nature of the Motive*

Deliberate choice depends on thought or reason; but in order that a man may choose the right, he must *know* what is

right. Here we come at once to what is probably the most common cause of a man's refusal to submit to treatment or operation—viz. *ignorance*. Lacking rational insight, he fails to apprehend his best interests and so often compromises his permanent welfare.

Ignorance, too, begets apprehensiveness, for "men fear death as children fear to go into the dark." But while sheer fear of the operation may be the sole deterrent, we should have an eye to the person's circumstances. Is he, for instance, a reservist, and does the operation hold out a hope of his being rendered fit for further service?

To take an example:

T. U., *æt.* 24, was transferred to Class W of the Reserve as a miner. Lodging a claim for pension, he was accordingly Boarded and found to be suffering from "piles" of moderate severity, which had certainly been aggravated by war service. He was advised to undergo an operation, but refused. His circumstances were such as rendered it doubtful whether his motives were wholly disinterested. He was not discharged, but only transferred to the Reserves, from whence he could at any moment be recalled to the ranks. But *unless operated upon* he was unfit for general service; hence presumably his reluctance to undergo operation.

P. B., *æt.* 26, had been a miner. Claiming a pension, he first denied ability to do any work, but subsequently admitted that he acted as a buyer of fish. He was the victim of a wound in the right arm which had implicated the musculo-spiral nerve. He was advised to undergo an operation—viz. *nerve suture*. This he refused on the grounds that his dependents would meanwhile starve. Assurance to the contrary had no effect; he remained obdurate—obviously preferring a pension plus his earnings as a fish-buyer rather than be restored possibly to full activity.

In both these cases the individual wilfully sacrifices his permanent welfare to his temporary interests; both—more anxious to obtain a pension than to get well—make capital of their disability.

We see the same in the sphere of *industrial accidents*. Men refuse operation to protract their stay on the funds or to secure a higher indemnity.

*The Attitude of the Doctor.*—Confronted by the subject who refuses prescribed treatment or operation, he must not play the part of the indifferent spectator. Mere passivity is not his rôle; but neither, on the other hand, is coercion. *Persuasion* is his *métier*. He must endeavour to convince the man of the advantage of the suggested treatment, of its advantage to him himself, and he should at the same time warn him of the ultimate consequences of his refusal. The faint-hearted he should encourage; with the merely ignorant he should be infinitely patient; but for those whose *bona fides* he suspects he should endeavour to bring home to them the immoral nature of their conduct. But threats or intimidations are inadmissible.

Also before presuming to pass a strictly moral judgment on a man's conduct we should recall that it is not the refusal, but the *motive* that matters.

> One point must still be greatly dark,
> The moving *why* they do it.

In passing a verdict we must think of his action, not as an isolated event, but as part of a system of life. We must judge its significance, not in the abstract, but as it applies to the person who does it—situated as he happens to be and viewing the world as he has learnt to view it.

In this way only can we judge his intention as a whole—viz. by weighing the various elements which serve as inducements to the man to submit or to refuse to submit to the operation. For the *operation* is the point at issue. Is the man weighing its pros and cons and these only, or is he swayed by other considerations ? Is he desirous of evading further service, bent upon obtaining pension ? Or, having been granted a pension, is he reluctant to undergo an operation which will diminish his disability with consequent decrease of his allowance ?

Again, is the suggested treatment or operation one attended with inappreciable risks, such as any ordinary individual in his own interests would undergo ? If so, then, if the claimant's circumstances are such as to give play to unworthy motives and the influence of which is discernible in his general attitude, we shall be justified in assuming that his refusal to undergo an operation is not based upon reason, but dictated by irrelevant and often sordid considerations, e.g. by self-interest, cowardice, greed.

### *The Nature of the Treatment*

Mackenzie, in his "System of Ethics," remarks: "A man's rights, in fact, are nothing more than those things which, for the sake of the general good, it is convenient that he shall be allowed to possess. . . . He is a part of a social whole ; and he has a right only to that which it is for the good of the whole that he should have." This may well serve as a prelude to consideration of the question whether a man is or is not justified in refusing prophylactic treatment.

*Protective Inoculation.*—It is unnecessary here to emphasize the brilliant prophylactic results obtained by *anti-typhoid inoculation.** Any misconception that may have prevailed regarding

* The success of this vaccine is remarkable both as a prophylactic and as a curative measure, and an expectation that it will clear the organism from carriers appears reasonable. In the Expeditionary Force in France the ratio of attacks is fourteen times, and of deaths forty-two times greater among the uninoculated men. (Moor and Partridge.)

this form of treatment has all but disappeared. In a recent discussion on inoculation in the Army the Under-Secretary for War observed that the prejudice against anti-typhoid inoculation in the Army is negligible.

In the case of a soldier formally refusing anti-typhoid inoculation we should take our stand on the point that such is necessary, not only in the interest of the individual, but of the *community* of which he is a unit. The consequences of his refusal are *not limited to himself*, but imperil his fellows, and his *refusal* is therefore *inadmissible.* Broca, discussing this point, would liken such refusal to a *military misdemeanour*, one justifying disciplinary repression.

Wheeler, discussing *tetanus* in the present war, observes that "the paucity of cases is an index of the success of treatment, and especially prophylactic treatment." Bazy states that in field-ambulances, in which surgeons systematically give *prophylactic* injections, the mortality is only one-third of that obtaining where *anti-tetanic serum* is only given in suspicious cases. In short, the injection of anti-tetanic serum may be regarded as of established *prophylactic* value.

Now, as Cavalie of Bezières has observed, a man *can refuse to allow himself to be injected with anti-tetanic serum.* This, we think, will generally be admitted, as the advantages of his compliance and alike the *disadvantages of his non-compliance* are delimited to himself. In the latter instance he may develop tetanus, and if so, may die; but, fortunately, he does not by his conduct imperil the life of his fellows. But if the victim be a married man, what of his dependents? The widow of the industrial worker, for instance, may demand compensation from the assurance company. In view of this possibility, therefore, the medical man should, at any rate as a measure of self-defence, always see to it that in any case of wound soiled by earth, horse-dung, cart-grease, etc., he impresses upon the subject the desirability of anti-tetanic inoculation. As an additional safeguard he should also, in the case of formal refusal, take care to obtain a written testimony to the effect that his advice was disregarded—the same certified by two witnesses. In this way he will, at any rate, clear himself from any possible imputation of negligence by the assurance company. In the case of soldiers the War Office Committee for the study of tetanus has issued a memorandum for the guidance of those responsible—adherence to which will secure the medical man from any aspersions.

Sachet, in his treatise on "Legislation in Industrial Accidents," vouchsafes his opinion that all hypodermic injections of prophylactic sera (anti-tetanic and anti-rabic), recognized as essential

or of value by the medical man, are among those necessary treatments to which the patient is held bound to submit.

*Physical Therapy.*—Thiem and other German experts have deplored the unnecessary expense incurred by assurance companies through disabled men declining to undergo certain *bloodless* methods of treatment. This is more particularly shown in *stiff* and *painful joints* in which massage, baths, electricity, mechano-therapy, thermo-therapy, exercises, etc., are essential for functional restoration. These entail practically no risk, and their value in reducing industrial incapacity and hastening return to work is unquestionable.

The man, therefore, who formally refuses to undergo such treatment may be likened to a *malingerer* who *protracts* his cure or *intentionally aggravates* his condition—this with the intention of prolonging his stay in hospital, of evading service, or to the end of increasing the amount of his pension or compensation. The same strictures may rightly be passed on the man who refuses to take the drugs prescribed for him, or who rebels against the prophylactic and curative measures enjoined in a sanatorium.

Fortunately, the Pension authorities have been alive to this possibility—viz. that a soldier, to exploit or make capital of his disability or infirmity, may with this intent refuse to submit to the methods of therapy necessary for its amelioration or cure.

Accordingly, without laying any compulsion on the individual, they make it clear that such passive resistance, such failure to co-operate on his part, may entail the reduction of his pension. By the terms of the following clause it will be seen that the Pension authorities have ample discretionary powers vested in them wherewith to penalize those guilty of such wilful behaviour.

"4. *Half the pension and allowances (if any) awarded under the preceding articles may be subject to the condition that the disabled man shall undergo medical treatment in or at a sanatorium, hospital, convalescent home, or otherwise, for any period during which it may be certified that such treatment is necessary in his interests.*"—Pension Warrant, 1917.

### *Refusal of Operation*

As to whether an individual has a right to refuse to undergo this or that surgical operation, the law has it that no man can be compelled to submit to any such procedure, even though it has for its end the amelioration of his condition.

This right to formal refusal of a surgical operation rests intrinsically on the risks incidental thereto, especially the risk of death from an anæsthetic, while to this must be added the

fact that all surgeons are not of equal skill. Moreover, the functional results of operative intervention cannot be assured with absolute certainty, but only with more or less probability.

Still the exercise of this formal right of refusal entails certain consequences—viz. it may involve reduction of a pension or compensation—this, of course, according to whether the refusal is held to be *reasonable* or *unreasonable*.

*Minor and Major Operations.*—The attempted differentiation, such as it is, is purely arbitrary—as much so as that drawn between so-called minor and major maladies. This because the evil potentialities of the most trivial wound, as of a common cold, are infinite, by reason of the ubiquitous microbe.

Still, it would be idle to deny that the risk incurred is less in some than in other surgical procedures. By common consent, this is true of *bloodless* operations and those not necessitating *general anæsthesia*. Into this category would fall, for example, rupture of adhesions in a stiff joint, or extraction of a tooth under novocaine, incision of a superficial abscess, extraction of a foreign body—bullet, etc.—when easily accessible.

In the foregoing or similar instances the operation is undertaken to *minimize the consequences of the initial lesion*. We know that, for example, a whitlow, if not incised, may entail most serious consequences—even loss of the hand. If a soldier or workman, therefore, refuses to submit to a slight operation—one not necessarily demanding general anæsthesia—and as a result loses his hand, he has himself to thank for the gravity of the disability incurred. In such event the State or employer could only be held responsible for the *direct* consequences of the initial wound, and not for those *sequelæ* attributable to the individual's refusal of surgical intervention. In other words, his continued disability is due, not to the initial lesion, but to his *unreasonableness* in refusing to submit to the operation.

Discussing this question of refusal of operation in relation to *soldiers*, the French Academy of Medicine came to the following conclusion. Viewing the matter from a purely medical standpoint and under the conviction that the highest medico-chirurgical skill would be available for soldiers, the Academy holds that wounded or diseased soldiers are not justified in refusing—

(1) *The clinical methods necessary for diagnosis ;* or

(2) *The medical and surgical procedures consonant with the present state of knowledge and deemed most appropriate for cure.*

The foregoing is, of course, a purely academic pronouncement, but in the French Army Orders of April 5, 1917, it is laid down that in case of formal refusal the method of dealing with the

subject varies according to the determining motive and the kind of treatment or operation proposed.

They consider that refusal to submit to *protective inoculation* is inadmissible. The right to refuse a *bloody operation with or without anæsthesia* is conceded. But in the case of *minor operations not requiring general anæsthesia*, refusal may entail reduction of the final allowance granted.

In the course of an address at the Inter-Allied Conference at Paris on the treatment and training of disabled soldiers, the Parliamentary Secretary of the Ministry of Pensions delivered himself as follows: "We have taken power to reduce a man's pension by one-half if he refuses the treatment offered to him in cases where he has been certified as requiring some definite form of treatment. *We do not propose to exercise this power in order to compel a man to undergo a surgical operation*, but only in cases where massage, electric treatment, treatment by machines for straightening out joints, etc., and other gradual processes have been offered, or hospital treatment for the sick." (The italics are ours.)

In light of this pronouncement we may well doubt the utility of any query (A.F. B. 179) as to whether a disabled soldier has been reasonable or unreasonable in refusing to submit to an operation. Moreover, if it is not proposed to exercise the powers above cited (viz. reduction of pension), how else does the State purpose signifying its sense of the soldier's *reasonableness* or *unreasonableness*?

Such a *laissez-faire* attitude—such a deliberate shirking of the issue—will assuredly bring its own Nemesis in the shape of abuse. There are men—and we must reckon with them—who, if they see a possibility of their pension or compensation being lowered as the result of some operation, will hug to themselves their disability.

"I will turn diseases to commodity."—*Henry IV*, i, 2

Then what of *urgent* operations? What of the man who refuses amputation of a limb menaced by *gangrene*, or, having a wounded eye, refuses enucleation, though threatened with sympathetic ophthalmia? The necessity for the operation in either instance is unquestionable. Non-compliance therewith may involve loss of a limb or total blindness, with their correlated incapacities. Or, to take a graver instance, what if a man, the victim of strangulated hernia, refuse operation? Death is his portion, but what of his dependents?

In all the foregoing or similar examples, is the whole responsibility of guiding the man's conduct to rest upon the *medical*

*officer*, upon his powers of persuasion ? Is it not the State's duty to reinforce the doctor's position—this, not by compelling the man to submit, but by holding out an inducement for him to act in conformity with his best interests ; in other words, to reserve to themselves the power of *reducing the pension* if it be proved to their satisfaction that the man's refusal was *unreasonable* ?

As before stated, the French Ministry of War, while conceding the right of a man to refuse a bloody operation with or without anæsthesia, nevertheless hold that exercise of this formal right of refusal may entail reduction of the final monetary allowance—notably in the two following contingencies :

(1) *If the operation is trivial and, above all, does not require general anœsthesia :*

(2) *If the operation be undeniably urgent and undertaken to obviate the supervening of a complication which may entail total or partial incapacity.*

The passive attitude maintained by our Pension authorities in this matter of surgical operations is the more incomprehensible in light of the findings of *civil courts* when called to adjudicate upon examples of *industrial incapacity incurred through refusal to undergo surgical operation.* The workman is held to be acting *unreasonably* (1) when all the medical witnesses advise an operation which does not involve appreciable risk, and which an ordinary individual would submit to in his own interests (*Paddington Borough Council* v. *Stack*, 1909, 2 B.W.C.C. 402) ; (2) when the workman is willing to submit to the operation, but is acting on the advice of his medical men, who, whilst regarding the operation as a slight and safe one, think it is unlikely to cure the incapacity, and the arbitrator, after hearing all the medical witnesses, is satisfied that a cure is reasonably certain (*O'Neill* v. *John Brown and Co. Ltd.*, 1913, 50 S.L.R. 450).

On the other hand, in the case *Tutton* v. *Owners of SS. "Majestic,"* 1909 (2 K.B. 54, 2 B.W.C.C. 346), it was held that a workman was *not unreasonable* in his refusal to undergo a surgical operation (1) when the latter is based upon the advice of his own medical man, who is of opinion that there is some risk to life.

A similar opinion was expressed in the case *Tweeny* v. *Pumpherston Oil Co. Ltd.*, 1903 (5 F. 972), (2) where a reliable and impartial medical man has advised against it ; also (3) where the workman's own medical man advises that the suggested remedy would be useless (*Moss and Co.* v. *Akers*, 1911, 4 B.W.C.C. 294) ; or (4) where it is admitted that the effect of the operation will not lessen the amount of compensation payable by the employers (*Molamphy* v. *Sheridan*, 1913, 47 Ir.L.T. 250).

In light of these judicial findings it is to be cordially hoped

that the Pension authorities, by virtue of the inherent powers they apparently possess, may reconsider their attitude towards soldiers who refuse to submit to authorized surgical operations—procedures undertaken to ameliorate their condition or to diminish their disability.

### *The Inconsistency of the Present Attitude*

The Pension authorities, it will be noted, have reserved to themselves the right of reducing the pension of a disabled soldier if he refuse to submit to certain more or less well-defined methods of *medical* treatment.

Doubtless the decision was arrived at in the best interests of the soldier. To have remained passive or indifferent to such refusal would have been tantamount to connivance at most reprehensible conduct.

Nevertheless, in so doing they tacitly acknowledge the principle that *refusal to submit to authorized treatment justifies a reduction of pension.* In practice, however, the principle was departed from in the matter of *surgical* as opposed to medical treatment. This differential attitude immediately provokes inquiry. On what basis is this differentiation effected ? Why penalize, say, the victim of a *stiff joint* while adopting a purely passive attitude towards the subject of, for example, a *whitlow* ?

If the former refuse *physical therapy* he runs the risk of losing *half his pension*, but the latter, if he refuse *incision*, forsooth, retains it.

The risk attaching to the treatment prescribed in either instance is *minimal*, but the possible results of non-compliance are infinitely more serious in the case of a *whitlow* than of a stiff joint. The very exigencies of life tend to correct stiffness, but left to itself, a whitlow *may cost a man his hand.* As to the *relative painfulness* of the two procedures there can be no question. The pain inflicted by timely incision of a whitlow is *momentary*, but exercise of a stiff and painful joint—e.g. a shoulder—may be not only excruciating at the moment of its performance, but for weeks or even months the man has to face this daily torture.

Further examples illustrative of the inconsistency and, we think, unfairness of such differential treatment of medical and surgical disabilities might be multiplied. Moreover, it is not compatible with the true interests of the soldier—his permanent welfare. Neither is the rôle of the indifferent spectator consonant with the ethical responsibilities of the Pension authorities.

### *The Drawbacks of Passivity*

If a man refuse a surgical operation and through the same incur an added disability which might have been obviated thereby, what is to be our attitude ? Is he to be evaluated for pension on the measure of disability attributable to the *original* lesion ; or is he, despite his *unreasonableness*, to be fully indemnified, not only for the initial lesion, but for the *consequences resulting from his refusal* ? The rate of evaluation would appear to depend on the answer forthcoming to the following question : Was his continued disability due to his *wound* or to his *unreasonableness* in refusing to submit to the operation ?

To take another possibility. If *prior to consolidation* of a wound a soldier has refused surgical operation, with consequent disability, and for which he receives a *permanent* pension, can he later on ask for *revision* of the allowance accorded him ? He cannot do so on the plea of *aggravation* of his condition if such aggravation is shown to be the outcome of his own refusal.

The position of a soldier would, we apprehend, be somewhat different if he were advised and refused operation *after consolidation of a wound.* True, if he submitted thereto his disability might diminish or disappear ; but the amount of his pension might likewise be *diminished* or *abolished.*

An employer, *once a wound is healed*, cannot compel a workman to submit to operation which would better his condition and consequently diminish the amount of compensation granted. It might, of course, be argued that the reduction of a pension or compensation is justifiable—counterbalanced, as it were, by the diminished disability and increased earning power which has ensued.

Lastly, if a disabled soldier refuse an operation and obtain a permanent pension, what *if he subsequently undergo that same operation*, with the result that the disability for which he received a pension disappears or is ameliorated ? This raises the question whether in instances of *unreasonable* refusal the Pension authorities would not be justified in *refusing to fix the pension as permanent.* Also, should there not be provision made that if a man after refusal of an operation obtain a *permanent* pension and *subsequently undergo that same surgical procedure* he can be called upon for *reassessment*, and his permanent allowance graduated according to the *measure of the disability remaining after the operation* ?

## Suggested Innovations

The outcome of our discussion of this question, the refusal of surgical operation, leads us, on the basis of decisions in courts of law—reinforced as they are by, for example, the French Ministry of Pensions—to the following conclusions :

(1) That *refusal to submit to authorized medical or surgical treatment justifies reduction of pension.*

(2) That refusal of a surgical operation shall be deemed unreasonable—

(*a*) If it be of relatively minor character, does not entail general anæsthesia, " does not involve appreciable risk, and which an ordinary individual would submit to in his own interests " ;

(*b*) If the operation is undeniably urgent, undertaken to obviate the supervening of a complication, capable of entailing absolute or partial incapacity.

We trust that no false reverence for their past pronouncements, no scare of being thought inconsistent, will deter the authorities from revising their attitude ; for it has been wisely said, " A foolish consistency is the hobgoblin of little minds, adored by little statesmen."

## CHAPTER X

# ADAPTATION IN RELATION TO DISABILITIES OR INFIRMITIES

### Adaptation

Use almost can change the stamp of Nature.—*Hamlet*, iii, 2

LIFE consists in the continuous adjustment of internal to external relations; in other words, every living organism reacts to its environment—and *adaptation* is the process whereby it is brought into harmony with its surroundings.

It is in the fascinating domain of palæontology, "that science of extinct forms," that we may best discern the wondrous ingenuity of Nature in adapting animals to the physical *milieu* in which they move and have their being. In his backward gaze down the abyss of Time the palæontologist has shown that animals —subjected to "alternations of habitats"—have responded by "alternations of adaptations." Not only does the organism as a whole become intimately fitted to its environment, but different parts thereof are adapted to their specific ends.

The morphological or *structural* modifications that with the passing of ages ensue are the outcome primarily of physiological or *functional* changes. It follows, therefore, that *adaptation* is merely the material expression of a *change in function*, and so it is that "from whatever order of mammalia or reptilia an animal may be derived, prolonged aquatic adaptation will model its outer and finally its inner structure according to certain advantageous designs." Thus in the Jurassic period no less than six orders of reptilia, which independently forsook terrestrial life, achieved adaptation more or less complete to sea life.

Similarly, in regard to the adaptation of different parts to specific ends we learn that in the land vertebrates the *feet* became modelled in varying fashion to suit the different media and habitats—whether aquatic, terrestrial, arboreal, or aerial. In like manner the *teeth*, in association with the structure of the skull and jaws, may undergo varied modes of adaptation to different kinds of food, whether herbivorous, insectivorous, or carnivorous. In short, the end results of adaptation in an animal are such that

all its component parts conspire to make it as a whole adaptive to its environment. With this brief introduction of our subject we must now narrow down our purview to Man, in whom, as in all living organisms, every change involves adaptation.

## Adaptation in Man

The faculty of adaptation—that priceless dower of all organic beings—attains its highest development in Man, playing a rôle in the *mental* or *moral* as in the physical sphere. "Has he defects of temper which unfit him to live in society? Thereby he is driven to entertain himself alone and acquires habits of self-help, and thus, like the wounded oyster, he mends his shell with pearl." So it is that through this same power of adaptation every evil to which we do not succumb becomes a benefactor.

Turning from the mental or moral to the *physical* sphere, it must be recognized that if the individual be plastic to his environment, it is no less true that his reaction thereto may be favourable or unfavourable.

If his response to "the sport of circumstance" be *adequate*, then *adaptation* is achieved. Thus *bodily growth* is the result of prolonged adaptation, as exemplified strikingly in the pigmies of Central Africa. Doomed to dwell in the sunless depths of primeval forests, their bodily frames have become adapted to their surroundings—their Lilliputian size fitting them the better to worm their way through otherwise impenetrable undergrowth.

On the other hand, if the individual *fail of adjustment* to his environment, then disability, leading to ultimate extinction, is the result. But too plainly is this portrayed in the miserable denizens that issue from noisome slums—how often do they display anomalies in growth and development—dwarfism, infantilism, senilism, and the like!

What is true of the body as a whole is true also of its *component parts*; they too possess this same faculty of adaptation. As Wolff long since pointed out, every *change in function*, even of the bones, is followed by changes in their internal architecture. In other words, the structure adapts itself to altered conditions, e.g. force exerted in abnormal directions. Note how the spine of the blacksmith in course of years develops a list in accordance with the traction exerted by the constant wielding of his hammer. In truth, the shape of the bones, as is well known, alters under the influence of different occupations; hence the various forms of spinal curvature observed in those who follow vocations necessitating faulty attitudes.

Enough has been said to indicate the sensitiveness of the

response of the organism to *external* circumstances, but, if we would grasp the full significance of adaptation, it is within the precincts of the body itself that we find the more subtle evidences of its interplay. For, as Hastings Gilford observes, " adaptation in a human being is of a triple nature, for he is capable of making adjustments in his capacity as a complex individual ; his organs carry on their work on a basis corresponding with their range of requirements ; and the cells, constituting his tissues, are capable likewise of purposeful adjustments."

## Adaptation in Disease or Injury

Truly wonderful are the " prudent adaptions and wise contrivances " displayed by the body when penalized by some disturbance of function—some lapse from physiological righteousness !

How admirably does the structure of the heart adapt itself to abnormal stresses and strains, whether of intrinsic origin or the reflex of some derangement in parts remote—the lungs or elsewhere ! If haply a lung cease to function or a kidney fail of its purpose, how surely does its fellow-organ enlarge—take on the dual task. Should an obstacle hamper the effluent of some hollow viscus—stomach, bowel, or bladder—how inevitably does the call for renewed *vis a tergo* find expression in thickening of the muscular layers.

In nothing is adaptation more clearly illustrated than in the processes of growth, in which, if it suffer retardation—as in *rickets* or *achondroplasia*—how striking are the structural adaptations ! All is in conformity, the growth of bones and muscles in well-nigh perfect accord. Similarly, in adolescence, if the development of a long bone be interrupted by *epiphysitis*, the muscular and other structures undergo *proportionate shortening*. The same too in adult life if a limb suffer anatomical loss, viz. adaptive retraction of the muscular and other tissues. For shortening of a bone entails approximation of the points of attachment of its related muscles, which thereby act at a mechanical disadvantage—a disability only to be circumvented by *adaptive shortening*. So it is that the damaged member is remodelled to suit occasion, and this with utmost nicety—to the end that its form and aptness for its office shall be preserved.

" This property of the living body to restore itself when deranged or to heal itself when broken or torn is an action which so frequently assumes the appearance of reason, as if it were adapting itself to the occasion, that John Hunter speaks of parts of the body ' as conscious of their imperfections ' and ' acting from the stimulus of necessity ' ; thus giving the properties of

mind to the body as the only explanation of phenomena so wonderful."

*The Economic Significance of Adaptation*

The innate capacities for readjustment resident in the bodily frame find ample scope in the sphere of *mutilations* or *injuries*. The disabilities imposed thereby upon the individual entail accommodation of himself to altered conditions. "In the fell clutch of circumstance" he is impelled to seek *physiological* or *functional adaptation* thereto. He seeks to supplement or replace lost functions by bringing into play others—at first imperfectly, but gradually attaining a higher measure of perfection. Haply his adaptive capacity may be such that the day comes when he is no longer conscious of his loss, experiences no inconvenience in the execution of his work, even though of highly specialized kind.

Yet how blind have we been as a whole to the *economic* significance of this beneficent biological phenomenon—*functional adaptation*! True, for long enough we have marvelled at the ingenuity, the resourcefulness of those, for example, born without hands or deprived of the same. We have seen how the feet take on an added skill, "becoming substitutes for the hands and working minute and curious things!" But have we not been too prone to regard such as freaks—the ingenuity as something bizarre and unusual—not seeing in them but another expression of that same faculty of adaptation, examples of which, though less dramatic, are so bountifully scattered in our midst?

So it was until Guermonprez in 1884 published a series of cases, showing how strikingly the consequences of serious injuries might, through the medium of adaptation, be ameliorated. But not till ten years afterwards did the practical—the economic—importance of the subject receive due recognition, when Blasius (1894), in a serious study on the subject, commented on the extraordinary manner in which the victims of injuries or mutilations were still able to compass difficult work—still able to earn an ordinary wage. He narrates the case of a lime-worker who, despite the loss of the thumb and three outer fingers of his right hand, had earned the same salary as his fellow-workers, and this for twenty-six years.

We may recall too the classic instance of the pensioner at Charleroi who, having lost both his hands, after equipment with an apparatus terminating with a magnet in the right and a hammer in the left stump, was able to place and drive home nails in the manufacture of brushes.

Lauenstein tells how a workman, notwithstanding the loss

of the right thumb, wielded scissors dexterously; while others deprived of both legs have provoked wonder by the ease and rapidity with which, when furnished with pilons, they have traversed crowded crossings. Numerous instances have been reported by Remy in his work, and one noted by President Duchaffour is worthy of a brief digression. A workman, having lost a finger, was approached with a view to his obtaining compensation. *Mirabile dictu*, he was surprised that there should be any wish to indemnify him for so trivial a loss. Already through previous accidents he had lost one leg and several fingers. Nevertheless he arrived at court on a bicycle, and from his own account of his earnings it was clear that, grievously injured as he was, he put to shame many workers more happily situated.

Schaeffer in 1901 tells of a workman who, when twenty-four years of age, sustained an unreduced dislocation of the hip with fracture of the neck of the femur. Driven by necessity, he by the end of a year was able to earn his full wage, and for twenty-nine years continued so to do, despite two inches of shortening in the limb.

Sircoulon, in a thesis published in 1904, observed that industrial incapacities amounting to 40 per cent. had, through functional adaptation, been brought down to 10·5 per cent. Again, Patry in 1907, from observations of twenty individuals who had lost fingers or hands, came to the conclusion that in the majority of trades a workman does not, even given loss of several digits or portions thereof, fail to earn his previous salary.

Wolf in 1907, Thiem, Schmidt (1911), and others add their testimony to the important part played by functional adaptation in ameliorating disabilities imposed by injury; but the most valuable contribution to our knowledge of the subject is perhaps that communicated by Julliard (1911). This observer, from a study of 307 individuals—the victims of varied mutilations—concludes that *in 75 per cent. of cases involving eyes or fingers no permanent industrial incapacity ensues.* He furthermore considers that *adaptation* should figure in medical reports as a recognized factor in attenuating or even abolishing the functional disabilities occasioned by injury.

This view of Julliard's, in the light of present-day developments, seems in the nature of a forecast; for war's aftermath has brought home to us the national importance of cultivating and reinforcing the latent power of adaptation which in varying measure is the heritage of all individuals. Inasmuch, therefore, as functional adaptation or *re-education* is destined to play a much more important rôle in the future than in the past, it is essential that the medical man familiarizes

himself with those factors that favour or militate against its development.

For the adaptive capacity of individuals varies within wide limits, as is clearly shown by the different periods of time required for functional adaptation, and this to injuries or mutilations of apparently similar nature. These discrepancies in response are explicable only by virtue of the multiplicity of the influencing factors, to the consideration of which we now pass on.

## Factors in Adaptation

Physiological or functional adaptation involves, in truth, the formation of a *habit*, not only of thought and will, but of bodily action. For an individual who is disabled or has lost a limb is in much the same position as a child learning to walk. There is no short cut ; he has to face repeated effort, repeated defeat, and at first performance falls far short of intention. He has to compass the contraction of certain muscles in due *degree* and *sequence* so as to realize the end aimed at with ease, rapidity, and economy of effort. At the outset he is inept, invoking the action of muscles which are *superfluous*, and which hamper rather than assist ; or the wished-for co-ordination is deranged through muscles not contracting at the *right moment* or with *appropriate strength*. By constant repetition of trials he achieves the *complex motor adjustment* he aims at. In other words, a fixed and uniform series of movements is organized which can go on of itself without conscious effort and which, in short, becomes *automatic*.

We see, therefore, that functional adaptation to a mutilation or disability implies the acquirement of a *new habitude of action* as a result of *persistent experimental effort*. It is clear, too, that if success is to be achieved certain mental or moral qualities or, more strictly speaking, certain " psycho-physical dispositions " are essential.

### *Innate Mental and Moral Attributes*

Individuals differ widely as to the readiness with which they meet new contingencies, form new associations. Calamity is the touchstone of character. The brave live not in " Doubting Castle " ; for them there is no Giant Despair.

> It matters not how strait the gate,
> How charged with punishment the scroll,
> I am the master of my fate,
> I am the captain of my soul.—W. E. Henley

* * * *

Others, again, are dominated by circumstances, easily depres ed and, weak in will and purpose, take the line of least resi tance. It is not in them to emulate Rabbi Ben Ezra :

> To welcome each rebuff
> That turns earth's smoothness rough;
> That bids nor sit nor stand but go.

Indeed, of such, some—embittered by " the bludgeonings of chance," like Timon of Athens—take up arms against Society, and in them the kindly offices of adaptation are but warped to evil ends. Under the influence of some congenital or acquired defect or deformity they may develop the most diabolical passions —commit crimes which from the very nature of their disability would seem impossible of execution. Perhaps the most striking instance is that recorded by Sir Charles Bell of a man who from birth was deprived of arms. " As if possessed by a devil, this wretch had committed many murders before being discovered and executed. He was a beggar, who took his stand in the highway some miles from Moscow, on the skirts of a wood. His manner was to throw his head against the stomach of the person who was in the act of giving him charity and, having stunned him, to seize him with his teeth and so drag him into the wood ! "

To resume, in the attainment of functional adaptation intelligence, courage, and the " will to win " are all-important. Dogged persistence is demanded of the man who would make good in the face of some disability—the *loss of a limb*, etc. He must be capable of pursuing a distant aim—which requires indomitable and repeated effort, and this often for a long time without much progress. While most easily realized in youth, it is astonishing how men of *mature* years adapt themselves to disabilities if endowed with strong will, perseverance, and energy ; " for they can conquer who believe they can." How often do they improvise mechanical appliances to compensate for their lost functions ! How strenuously do they cultivate new synergies or combinations of movement in substitution for or to supplement their lost powers ! Julliard tells of a man who, deprived of the right hand and two-thirds of the corresponding forearm, nevertheless outstripped all his fellow-workers as a quarryman. In another instance an Alpine huntsman, thirty years of age, wounded in August 1914, was taken prisoner by the Germans. They amputated his left leg at the upper third and later, to improve the stump, reamputation was performed. In March 1915 he was repatriated, and in May, eight days after return to his home, was fitted with a pilon. Immediately he set to work on the land, and a month later was able to compass walking on a mountain-side. Soon

too he was able to climb trees with agility, mount a horse without help, and to ride at a trot as well as at a gallop.

Examples of this nature might be multiplied, but, alas! there is the reverse side of the picture. We are all familiar with the *industrial worker* and alike the *disabled soldier* who, more intent on *compensation* or a *pension*, make the worst rather than the best of their disabilities.

Sometimes they lack intelligence, but more often lack a proper sense of Duty, or are deficient in courage and perseverance. As soon as their claim is settled or their pension granted they think no longer of work, but of enjoying their gains. The sudden accession of a monetary allowance in such persons but opens up a free field for indulgence of latent vicious tendencies. Preferring, as they do, "bondage with ease to strenuous liberty," they take no pains to discover means wherewith to obviate their difficulties, and consequently functional adaptation is tardily, if ever, accomplished.

### *Idiosyncrasies, Bodily Aptitudes*

The adaptive power, i.e. the faculty of adapting means to proximate ends, is certainly more highly developed in some than in others. Witness how some take naturally to boxing or fencing or similar activities, which require rapid adaptation to constantly varying conditions. Others fail to achieve this same swift and sure co-ordination of hand and eye. The differences would appear to be determined by *innate psycho-physical aptitudes*. Some are naturally supple of mind and body, others rigid and unbending; hence the varying ease with which adaptation is secured.

The influence of *congenital* endowment is clearly displayed in those who with equal facility can use either hand. The *ambi-dexterous* person is clearly at an advantage if he lose an upper limb. For him it is a matter of relative indifference whether he lose right or left extremity. But, fortunately, for those less favoured, *adaptation* is largely a matter of time—the remaining limb rapidly acquiring the functions of the lost member.

Again, the power of adaptation to a disability will be more capable of realization *if the organism as a whole be otherwise intact*; but if the subject of some general disease or the victim of previous accidents, this faculty may be correspondingly compromised.

Certain *constitutional disorders* such as syphilis, scurvy, alcoholism, or osteomalacia may, for example, retard or prevent the healing of a fracture, and anatomical union being a necessary prelude to functional adaptation, the latter is more tardily

accomplished. In the subjects of *cardiac disease, systemic nerve affections*, or any *debilitating disorder*, adaptation to the loss of an arm or a leg may be with difficulty achieved, either as a consequence of increased strain, impaired powers of co-ordination, or sheer weakness. Indeed, the mere conformation of the subject may prove an obstacle to adaptation. Thus, as Julliard observes, *obese* persons have much greater difficulty in accommodating themselves to some mutilations than thin individuals.

Again, given *multiple* lesions, adaptive capacity may be seriously interfered with, but not always so. The subject may have sustained a *previous* accident to the limb, and according as to whether adaptation thereto has been attained or not, so will the restoration of the later lesion be favourably or unfavourably affected.

The limb may sustain *simultaneously* several lesions, and if so, the process of adaptation is correspondingly hampered. To take an example, all the joints of the arm are subordinate to the use of the *hand*. If, therefore, the latter be crippled by the loss of one or more fingers or ankylosis of one or more joints, the adaptive capacity of the subject will be gravely prejudiced if, in addition, the mobility of the *shoulder*, *elbow*, or *wrist* be compromised. This for the reason that, given ankylosis or loss of a portion of the hand, all the latent potentialities of the otherwise intact limb are invoked to promote the formation of new habitudes of action. In other words, fresh synergies, new associations of movement, are enlisted to supplement or replace the lost capacities.

Similarly, in the lower limb, if to *shortening* or *ankylosis* there be superadded a *nerve lesion*, functional adaptation will be correspondingly more difficult. Accommodation to the disability is delayed—this directly in proportion to the importance of the nerve involved. The more numerous the muscles supplied thereby, the more gravely is the power of initiating new modes of action, fresh co-ordinations of movement prejudiced.

### *Age, Sex, Social Condition*

Youth, athirst for novelty, eager for fresh enterprise, contrasts with Age, its obtuseness to new impressions, its intolerance of change. For it is during the period of growth and development that mind and body are most plastic, but with the attainment of maturity the acquisition of new modes of action and alike the discontinuance of those which have become habitual are difficult. In other words, habits in youth are easily acquired, easily relinquished ; not so in later years, when we become tenacious of custom, lovers of the beaten path.

This *adaptability* of the young as opposed to the old is clearly shown in their varying reaction to *injuries* or *mutilations*. How readily do the pliant forms of youth adapt themselves to unusual attitudes when trunk or limbs, for purposes of treatment, are sheathed in some apparatus! How swiftly do they accommodate themselves to some mutilation or disability! With what ease is shortening of the limb compensated by pelvic displacement and curvature of the supple column! and if haply the movements of the shoulder be restricted, how quickly does the mobile scapula adapt itself! In short, *the younger an injured person is, the more susceptible is he of adaptation*—the greater his chance of accommodating himself to his disability. Still, while youth is *par excellence* the age for adaptation, it is impossible to fix a period at which it cannot be achieved. For, as before observed, the most marvellous instances of adaptation occur in those of *mature* years.

*Sex* plays but a subsidiary rôle, but, as Julliard points out, given loss of one or more fingers, though the mutilation be more detrimental to her, a woman is more deft in enlisting compensatory or supplementary movements. Lastly, when *skill* rather than brute force is required—e.g. in loss of limbs, etc.—men are inferior to women in the ease and rapidity with which they adapt themselves to such defects.

In the matter of *social conditions* the single man is more apt to be slothful in acquiring adaptation than the married individual who has given "hostages to fortune." The stimulus of necessity undoubtedly quickens the desire for adaptation, and the more alive the subject is to "moral imperatives" the more likely is he to realize his innate potentialities.

### *Occupation*

The observations of those engaged in the readaptation to work of disabled or mutilated soldiers clearly indicate that we must not rashly assume that the victim must necessarily change his occupation. Experience in therapeutic workshops shows that only in very rare instances—severe mutilations and such that pursuance of his wonted employment involves danger to himself or others—is *change of vocation* imperative.

It by no means follows that if a man has lost certain fingers, or has shortening of a leg or restricted mobility of one of the joints thereof, he must relinquish his former occupation. Certainly no such decision should be arrived at until the subject has undergone thorough examination. Then, too, one should ascertain the *particular movements essential for the performance of his work*, and how, if possible, the lost functions can be supplemented

or made good by substitution. In later sections—notably *Ankyloses*—we have entered more fully into the compatibility or not of the lesion with the pursuit of particular employments.

Certain lesions, notably *loss of an eye*, demand careful consideration before we suggest change of occupation. Simultaneous *binocular* vision, viz. the appreciation of depth or stereoscopic vision, is a *sine qua non* only in certain well-defined vocations, for pursuit of which the sense of "relief" is demanded. Given loss of an eye this faculty is lost, and the subject is further handicapped by restriction of the visual field on the side of the blind eye.

The occupation, therefore, must be considered in the light of these two disabilities. *Loss of the sense of "relief" or depth* unfits a man for working at a height, on a scaffolding or a ladder, for he is incapable of precise and delicate adaptation of his movements to varying space relations; he cannot trust his eye to measure the distance when he steps from rung to rung or plank to plank. A false step in such conditions may entail death; consequently, if the victim be a mason, a tiler, a painter, a plasterer, etc., a *change of calling* is unavoidable.

Again, for certain employments an intact *field of vision* is essential. In some trades the subject himself may be endangered by this defect, while in other employments he may be a *source of danger to his fellows*. Thus, if he work in a factory amidst a network of machinery he may become entangled by unprotected gear; while if he be a coachman or chauffeur he may, through his disability to judge distance, collide with other vehicles. But *central vision* in the case of *one-eyed* persons is not adversely affected. Given both eyes, convergent movements are required for the fixation of near-lying objects; but if the subject has only one eye these movements are not necessary—the ends being attained by means of *accommodation*. So, as it happens, even the most delicate occupations may be practised—viz. those of watchmakers, jewellers, etc.—and, moreover, it does not interfere with the pursuits of sportsmen. We see, therefore, that we should have an eye to the exigencies of the man's trade before we counsel a change of occupation. To this end, therefore, we should in all instances enlist the aid of some person proficient in the trade under consideration, for this is peculiarly a case in which technical knowledge is of prime value.

For even in the same trades there are, so to speak, grades. Thus a machinist may be able to work a plane or a circular-saw but lacks the skill to work a spindle. The disability laboured under, therefore, must be viewed in the light of these different possibilities.

Apart from the fact that there are many avenues open in the same trade, there are various occupations which demand of the workman much the same aptitudes one as the other. This is important in view of the fluctuations that obtain in the industrial market. We have to recollect, too, that there are certain trades in which the supply for skilled workers does not equal the demand. Thus Julliard tells of a machinist who despite the loss of the whole of his right thumb, was competed for by several masters; but his employers, equally alive to his excellence, immediately increased his salary to retain his services.

Lastly, we should always take into consideration the *intelligence* of a person, as this is all-important, for to re-educate or readapt him to his former occupation may require a larger measure of intelligence than he is capable of. Therefore it may be more politic to advocate a change to some vocation in which his particular disability is less in evidence.

### *The Nature of the Lesion*

The measure of functional adaptation that can be achieved in an injured limb will obviously depend largely on the character of the trauma sustained. Not only has the site and extent of the injury to be considered, but also its method of repair and mode of evolution with or without complications.

*Site.*—The direct consequence of wounds at certain sites may be more serious than at others. Punctured wounds in the neighbourhood of a *joint*, for instance, may involve nerve, tendons, or the articular cavity. Again, the liability to *sepsis*, with its sequelæ, varies somewhat according to their location. Those situated in the axilla, hands, feet, etc., are very likely to become infected. If *suppuration* ensue, neighbouring nerves may be involved or the movements of related tendons and joints compromised. Functional restoration or adaptation, therefore, will be correspondingly belated or incomplete.

The importance of site is very clearly shown in the case of *fractures*. As we are aware, a good *functional result* is most likely to ensue when *perfect alinement* of the fragments has been secured. Now fractures at certain sites are more prone to *non-union* or *mal-union*. Thus in fracture of the shaft of the *humerus* non-union is relatively frequent; in the shaft of the *femur* angular deformity and excessive callus-formation are more common. Now, a *pseud-arthrosis* will obviously portend prolongation of the period of incapacity. Vicious union or exuberant callus may hamper the effective action of the related muscles, while pain may follow the involvement of nerves—all of them factors unfavourable to

adaptation. Again, fractures at certain sites are more likely to involve *nerves*. At the upper end of the fibula the *peroneal*, and in the shaft of the humerus the *musculo-spiral* are likely to be implicated. Lastly, the prognosis of *intra-* and *juxta-articular* fractures is sombre as to functional restoration—especially in ankle, wrist, or elbow.

*Extent.*—The deeper, the more extensive a wound, the more likelihood is there of involvement of the muscles, joints, and other important structures. The remote outlook, too, is more gloomy, for wounds with large skin apertures attended by great laceration and contusion of the soft parts are more likely to become *septic*. Again, in *fractures* the utility of the bone depends largely on the extent of the trauma. If this is severe—e.g. *multiple* fracture of the leg, double fracture of the femur—a good functional result is less likely to follow. Lastly, extensive wounds may involve *anatomical loss*, e.g. deprivation of one or more fingers or a limb. Now the German Imperial Insurance Office in many instances has decreed that pure anatomical loss does not *per se* justify a claim for compensation. They hold that it is necessary to prove that it has seriously affected industrial capacity, and that the process of adaptation thereto has been prevented or rendered impossible. If it be a matter of the loss of one or two fingers or toes we should recollect that adaptation is usually much easier of realization than if the digit or digits were the seat of *vicious ankylosis*. On the other hand, if it be graver and involve the wearing of an artificial limb, adaptation will be greatly retarded and more or less compromised.

*Mode of Repair.*—If a wound heal by *primary union* the process of adaptation is not adversely affected—in fact, the contrary. On the other hand, if through loss of substance, destruction of tissues, or sepsis, healing can only take place by *granulation*, this latter brings its Nemesis in the form of *scar-tissue*. With its tendency to *retraction* this may lead to grave consequences. In the *face* it may lead not only to disfigurement, but to widening, narrowing, or even occlusion of apertures; while in the *limbs*, according to its site, scar-tissue may gravely compromise the mobility of important joints. Apart from these mechanical consequences adaptation may be hindered by the scar remaining *painful, unduly friable*, or by nerves or tendons becoming entangled in the cicatricial tissue.

In the same way, in fractures adaptation may be retarded by *failure of union* or *vicious union*. In injuries to joints accommodation to the disability may be delayed through thickening of the capsule, matting of tendons, or adhesions of extra- or intra-articular site.

*The Presence of Complications.*—In wounds or injuries it must be recollected that adaptation in great part has to be realized after anatomical repair has ensued, though functional restoration has still to be accomplished. We see, therefore, how gravely adaptation may be retarded by post-traumatic sequelæ—pain, œdema, abnormality of scars, etc.

Thus, for example, in fractures of the shafts of *tibia* and *fibula*, union with deformity or painful callus often ensues. Apart from this, they are often associated with *thrombosis*, *œdema* of the limbs, and *trophic* troubles.

In *dislocations*, especially those of the hip, *laceration of the muscles* may lead to permanent lameness, and dislocations of the shoulder, etc., are very liable to *relapse*.

Again, in injuries of the *joints* we should be very cautious in assuming perfect functional restoration. *Slight sprains* may be followed later by *arthritis*, especially in the shoulder; while in the knee recurring disability through some internal derangement is only too common.

## The Influence of Treatment and Training

The true rôle of therapy is *restoration of function*—not anatomical repair. Yet how easily is this vital issue either wholly overlooked or subordinated to mere tissue-consolidation!

How often, for example, is the healing of a palmar-wound achieved at the expense of restricted mobility of the fingers or even ankylosis! How frequently, when we are absorbed in the healing of a wounded forearm, has the neighbouring elbow paid the price of our obsession—in stiffness! How commonly, too, in our anxiety to secure the healing of a fracture, do we overlook the pernicious effect of immobilization on the related joint or joints! Fixation—indispensable for healing—is yet the arch-enemy of functional adaptation to altered conditions.

The true moral of these lessons is that all modes of therapy should be subordinate to the attainment of the one supreme end—the restoration of function.

### *The Acceleration of Functional Adaptation*

In all injuries our desire to secure healing of the primary lesion must not blind us to the fact that the period of incapacity is often lengthened through neglect to treat or obviate the development of post-traumatic sequelæ.

We should, therefore, in all injured limbs recollect that the object of treatment is twofold.

(1) *Dissipation of the Pathological Residua of Trauma.*—By these are understood the circulatory disorders—hyperæmia, stasis, and œdema; nervous troubles—hyperæsthesia, trophic disturbances, motor disorders, muscular wasting; joint disturbances —stiffness of ankylosis, etc.

It is these same phenomena, direct and indirect, which constitute the major part of the aftermath of wounds or injuries. It is their persistence that retards the process of readaptation to work.

To obviate their development, or when established to promote their disappearance, we must enlist in timely fashion all those physical modes of therapy—viz. massage, exercises, hydrotherapy, etc.—which stimulate the circulation, render ligaments supple, muscles more vigorous, nerve-endings less sensitive.

In this way the damaged tissues recover tone and the way is paved for the more swift attainment of the final object of our therapy.

(2) *Development of Functions destined to replace permanently or temporarily those which are lacking.*—The injured or crippled member has to be readapted to work, and while the initial stages of convalescence may rightly be utilized for massage, electricity, etc., these are but the means to the end. Invaluable while the injured parts are too sensitive or too stiff to admit of resumption of work, these modes of therapy must not be persisted with too long. Chiefly passive in nature, they must anon be exchanged for that *active exercise* which is so much more potent in restoring function.

When wounds are healed, dressings abandoned, even though stiffness, hyperæsthesia, or œdema persist, active exercise in the form of *work* is indicated—not abruptly to begin with, but by easy stages, and preferably at first by blend, as it were, of physical therapy with some professional exercise.

Well has it been said that "the labour we delight in physics pain." What better than work—with its purposeful efforts, its obligatory contacts—to deaden undue sensitiveness! What agent more potent in hastening the dissipation of pathological residua—more subtle in bringing into play latent adaptive capacities!

The workman or soldier with mutilated limb, when first he essays work, naturally seeks to protect his crippled limb. If his right hand be injured or lost, his left is enlisted to perform its function. But bit by bit the wounded member, as his interest warms, participates—is led insensibly to co-operate. *Automatism*, as before observed, is the desired goal of the mutilated or disabled individual, and of all the ancillary influences that make for its attainment the most important, perhaps, is *rhythm*—that primitive endowment of all living protoplasm.

*Rhythmic Activity an Aid to Adaptation*

As that thoughtful writer Hastings Gilford has remarked: "Few of us realize the enormous importance of periodicity or rhythm in evolution and individual development."

Man through the medium of his rhythmic faculty is brought "in tune with the Infinite." Within the boundaries of his puny frame, in the orderly sequence of systole and diastole, in inspiration and expiration, we catch an echo of the cosmic manifestations of rhythm, the ebb and flow of tides, the undulations of light, sound, and less-known radiations.

Sir Charles Bell long since realized its profound significance—"the capacity of organic beings, not only to respond to external stimuli but to react thereto in rhythm." "A man will put down his staff in regulated time, and in his common walk the sound of his steps will fall into a measure. A boy striking the railing in mere wantonness will do it with a regular succession of blows. This tendency of the muscular frame to move in accordance with time is the source of much that is pleasing in music and assists the effect of melody.

The hand
Sang with the voice, and this the argument.

But apart from the pleasurable feeling-tone excited by a rhythmic succession of sounds and movements—rhythm has an *economic* value. Its influence implies a *preadjustment* for what is coming. The effect of a single stimulus is thus reinforced—multiplied indefinitely to the end of obtaining an *orderly sequence* of impulses. In this way waste of energy is avoided and *economy of effort* attained.

The salient part played by rhythm in the *re-education* or *readaptation to work* of disabled or mutilated individuals scarcely needs emphasis. The exigencies of life, of their vocation, demand the acquisition of new motor adjustments. Innumerable motor impulses have to be marshalled so as to secure a simultaneous and serial co-ordination of movements directed to one specific end. The nerve stimuli involved must be of a certain intensity, duration, and rapidity, and must accompany and follow each other in a certain sequence. To achieve his aim—easy and effective motor adjustments—repeated performance of the desired action is essential, and here to his aid comes *rhythm*. For all workmen who have to repeat a movement again and again fall instinctively into a regular rhythm. The blacksmith plies his anvil "with measured beat and slow," even as the sailor hauls on the rope in a measured sequence of effort and relaxation. In

this way waste of energy is obviated, the maximum of efficiency attained.

In conclusion, it may with justice be remarked that these observations on functional adaptation, its beneficent ends, seem applicable only to manual workers. What, may it be asked, of the priest, the physician, the artist? "Ay, there's the rub!" But we cannot doubt that in their case also the natural history of calamity will to itself be true—that after long intervals of time some measure of adaptation will be their compensation. "A fever, a mutilation . . . seems at the moment unpaid loss and unpayable." At one fell stroke their way of life is revolutionized, their wonted occupation estranged. But haply the new vocation may evoke latent capacities unguessed at, open up a vista full of promise; and "the sure years reveal the deep remedial force that underlies all facts."

## The Influence of Legislation

That legislation exerts an influence on functional adaptation is unquestionable. Statistics prove that given an injury, e.g. a fracture, the average period of absence from work in the *assured* exceeds that noted in the non-assured person. How frequently do the victims of industrial accident pretend to be unable to do any kind of work pending the settlement of their claim! How often do they return to work the day after and do yeoman service with their alleged weak limb!

In certain countries—e.g. Germany—indemnification for industrial accidents takes the form of *weekly compensation* or *annuities*; in others—viz. Italy, and in Switzerland up to passage of the new law of 1911—any damage after injury was compensated once and for all by a *capital sum.* The outcome of these different modes of legislation is reflected in the varying periods of incapacity exhibited by the beneficiaries under the two systems.

Thus, when compensation for an injury takes the form of a capital sum, as in Italy, *functional adaptation is achieved much more quickly* than in countries in which, as in Germany, a system of annuities is in vogue. That it should be so is quite intelligible, for the man who realizes that so long as he can show reduced industrial capacity so long will he be in receipt of compensation is less inclined to shorten the period required for functional adaptation than the individual who, having already received a capital sum, has no further incentive to prolong the period of his industrial incapacity. Thus Julliard observes that in Switzerland those who have lost a thumb or several fingers not only after

some weeks earn full wages, but after twelve months become habituated to their loss—viz. achieve functional adaptation; whereas in Germany after similar mutilations several years elapse before the same is accomplished.

Again, the rapidity with which functional adaptation is attained varies according to the *rate* of annuity granted; the *higher it is the longer the period required.* In this respect the findings of Continental observers are confirmed in our own country by experience gained under the Insurance and Compensation Acts. No factor is more potent in prolonging the period of incapacity, viz. delay in functional adaptation, than *overinsurance.* In other words, the victim of an "industrial accident," if he in addition to his compensation allowance be in receipt of a subsidy from one or more clubs, may well be better off when ill than when at work. Could anything be less calculated to engender *self-help*—the handmaid of adaptation, which is essentially the offspring of work and exercise! Thus it is that legislation, when lacking in *ethical* sense, compasses the *temporary* interest of the individual at the expense of his *permanent* welfare.

This beneficent biological phenomenon, *adaptation*, needs to be fostered rather than discouraged; for undeniably the idle man, though relieved from anxiety, attains it less speedily than the injured person who resumes work before complete cure. Straying from the sphere of *industrial* injuries to that of "accidents of war," we see the same factors at work hastening or retarding the acquirement of adaptation. The soldier, while his pension is subject to revision, is often inexplicably tardy in accommodating himself to his disability, but once its permanency is secured his ineptness may quickly and strikingly improve! But not always so, for there are some who out of sheer indolence prefer to remain idle on a pension rather than to earn wages while still enjoying the same. If, therefore, we would curb such vicious tendencies, we have an instrument to hand in *revisional examinations*, which if conducted carefully should enable us to decide whether or no the process of adaptation is pursuing its normal course.

If abnormally delayed through indolence and lack of effort, we should refrain from considering the incapacity as *permanent* and the pensions should be revised as long as the subject is, in our opinion, capable of *progressive functional amelioration.* Lastly, in view of the fact that functional adaptation ensues more quickly in cases awarded a *lump sum* than in those receiving weekly compensation, we should give full scope to our powers of recommending in suitable cases a *gratuity* rather than a pension.

The foregoing observations on the factors that favour or

militate against the acquirement of adaptation will, we trust, have made clear its *economic* significance—its intimate bearing on the dispensation of *pensions* and *compensation*. In further elucidation of this relationship, it now devolves upon us to indicate the various steps by which we may be able to establish, not only the existence of adaptation, but the measure of its realization.

## The Evaluation of Functional Adaptation

The age of the subject first arrests attention, and, *ceteris paribus*, the younger he is, the more likely is his adaptive capacity to be of high grade—albeit this only if he be of *average mentality* and, no less important, possessed of a lofty sense of duty with its correlated impulse to hearty co-operation and perseverance. Obviously, the more highly specialized the work he pursues the more pronounced will be his difficulty in accommodating himself to his disability. The greater the obstacles to overcome, the more strenuous the demand upon his mental and moral equipment. Consequently, we should always take into consideration these *intrinsic* qualities in attempting to assess the potentialities of the subject in respect of adaptation. His social environment, too, should be reviewed, especially in regard to factors likely to stimulate or depress his desire to regain his functional aptitudes.

All the foregoing should be judged in light of the *interval of time that has elapsed* since the accident. Even allowing that no arbitrary period can be fixed for its attainment in any particular disability, the medical man, if familiar with the life-history of injuries and their sequels, should be able to make a shrewd guess as to whether the progress achieved is reasonable. Broadly speaking, given the lapse of a sufficient interval and the absence of any factors calculated to hinder functional adaptation, the assumption that the process of that habituation thereto is in operation or accomplished is most probable.

If, notwithstanding, the subject plead *incapacity for work*, to what does he attribute the same? Generally speaking, in the vast majority of cases *pain* or some other subjective sensation, such as stiffness or weakness, is alleged. Of these pain is the one the reality of which is so difficult to substantiate. In such a dilemma, if we have reason to suspect the subject's *bona fides* we may, after exclusion of all *organic* or *psychogenic* causes, proceed to direct tests for simulation.

Elsewhere, in our work on *malingering*,* we have dealt in detail

* "Malingering, or the Simulation of Disease."

with the methods available for the detection of simulated pain and other subjective sensations. Space, however, forbids our enlarging here on this point, but we would remark that, fortunately, in most cases of injury *one* limb only is involved; consequently the opposite member is available as a control. Accordingly, if pain or tenderness be alleged on *pressure* or *movement* we should note whether the same give rise to *alterations in the homolateral pupil, changes in the pulse rate* or *blood-pressure.* If such occur on pressure or exercise of the injured limb, but not when dealing with its fellow, the pain may be held to be genuine. Conversely, if no differentiation on this basis can be effected it will suggest, if not *simulation*, at any rate *exaggeration.*

Similar sensitive tests based on the "reciprocal innervation of antagonistic muscles" and so forth are available for the detection of *simulated paresis* or *weakness.* If pain or weakness do really exist it does, of course, show that adaptation is *not* accomplished; if, however, their absence is demonstrable it proves, at any rate, that the greatest obstacle to adaptation is removed.

Our next step in the investigation will be to scan narrowly the injured limb to ascertain the existence of *anatomical* or *structural* anomalies that—

(1) Retard or prevent functional adaptation;

(2) Indicate the accomplishment of functional adaptation.

But before proceeding to discuss in detail these two possibilities it will, we think, be politic to refer to certain sources of fallacy that arise in this connexion.

### *Objective State in relation to Adaptation*

We are but too apt to believe that if a lesion or mutilation is permanent the functional or industrial incapacity thereby occasioned will also be permanent. But brief reflection, however, suffices to show that *no constant correlation obtains between the anatomical or objective state and the functional or industrial incapacity.*

Thus, a deformed or injured limb may have remained unaltered for years, but it does not follow that the individual's functional disabilities have also remained *in statu quo.* The victim of congenital club-foot starts heavily handicapped in life; but, though the deformity remain unchanged, witness the skill and agility in locomotion which he ultimately acquires! Again, a man may lose a finger, and, *objectively* speaking, his loss is permanent—immutable. Not so the *functional* aptitudes of his hand. True, these are impaired for a while, but eventually,

through adaptation, are regained. In short, *permanency of anatomical lesion or loss does not necessarily predicate permanency of functional or industrial incapacity.*

But if the *degree* of functional disability cannot be deduced from consideration of the *objective state* alone, nevertheless this latter is not without its influence thereon. Alike in mutilations and disabilities the injured member regains its working capacity through the medium of *functional adaptation.* Now, broadly speaking, if in the course of months or years the *anatomical* lesion gets worse or improves, the acquisition of this same *functional adaptation* is correspondingly retarded or facilitated. Coincidently, the indu trial incapacity undergoes a parallel increase or decrease.

To sum up, *aggravation of the objective state retards or prevents,* but *improvement* of the same *favours the realization of functional adaptation.* With this brief digression we may now proceed to continue our investigation of the injured limb under review in regard to these points.

### *Objective Hindrances to Functional Adaptation*

The conditions that militate against the acquirement of adaptation are many and diverse, and a number of these have been indicated in the section dealing with the nature of the lesion. Accordingly, without any pretence to being exhaustive, we may refer to the following eventualities :

(1) The presence of pre-existing lesions, the nature of which hampers the necessary mechanism of adaptation.

(2) Tenderness, fragility, or other morbid change in scars of amputation, stumps, etc.

(3) The persistence of traumatic sequels or collateral phenomena, œdema, etc.

(4) The supervention of complications, e.g. phlebitis in fracture of thigh or limb.

(5) The development at the site of the lesion of a tuberculous focus or of a neoplasm.

(6) Other bodily defects of internal organs, etc.

Given elimination of the foregoing or similar unfavourable factors, are there, on the other hand, *evidences of amelioration* of the anatomical condition ? If so, are there, in addition, discernible any *structural modifications* which indicate the accomplishment of functional adaptation ?

*Anatomical or Structural Evidences of Functional Adaptation*

To determine these objective evidences, close scrutiny, not only of the injured member, but of all parts that come into connexion therewith, is essential.

The good offices of adaptation are not limited to the damaged extremity, but reverberate, as it were, throughout the whole bodily frame. Some of the structural modifications that ensue may escape all save the skilled observer, while others more massive "he that runs may read." The state of the skin, the muscles, the bones, the general bodily conformation, must each and all pass under review.

*Cutaneous Changes.*—In the upper limb all functions reach their consummation in the *hand*. So it is that the functional consequences of injury in the arm are mirrored in the impaired aptitudes of this delicate instrument. Conversely, it is in the hand that we may first discern the tokens that mark the incidence of adaptation to a disability—whether located in the hand itself or elsewhere in the limb.

As we know, the horny layers in the epidermis of parts subjected to prolonged but intermittent pressure undergo thickening, viz. *hyperkeratosis*. If the *general* surface of the palms or soles be exposed to friction the cuticle undergoes defensive thickening. If the pressure be more *localized* the resulting callosities are similarly circumscribed. Indeed, the trade or occupation of the subject can often be determined from the particular situation of the callosity.

Turning to the sphere of *injuries* or *mutilations*, we find the same protective adaptation. In the disabled hand callosities form over an area subjected to rude contacts or friction; similarly in the foot. Thus, for example, in *talipes equinus* indurations form on the fore part of the sole, but if the condition of *varus* be superadded, on the outer side or even the dorsum of the foot. It is by such defensive coverings that abnormal sensitiveness is blunted.

But these adaptive thickenings do not arise *de novo*, but only in response to *external stimuli*. Moreover, they take *time* for their formation. Consequently, their existence is an index that the subject not only *uses* his hand or foot, but that *the same is becoming inured thereto*. Now if, for example, in an injured hand we find the skin ingrained with dirt or other foreign matter incidental to certain trades and, moreover, presenting callosities not referable to any previous toil, we may with reason conclude that the subject has become *habituated to the consequences of his disability*. The presumption would be strengthened, too, if the callosities

are located in *unusual* places—sites determined by the nature of the disability, tokens of the acquirement of some *novel association of movements* calculated to replace the lost aptitudes of the hand.

*Changes in Muscles.*—The *wasting* of muscles—either a result of disuse or direct or indirect implication—being so common an accompaniment or sequel of injury, their functional restoration is a necessary prelude to adaptation.

Our appreciation of their condition will be the more easy if the *opposite limb be intact*—capable of being invoked as a control. If careful mensuration show that the muscles of the injured member are as well developed as those of its fellow—viz. all atrophy has disappeared—and, moreover, electrical reactions are normal, we may assume that as far as these structures are concerned their condition points to adaptation having been achieved. The persistence of a moderate amount of muscular wasting, provided the electrical responses are perfect, does not, moreover, negative the presumption.

If *muscular weakness* be loudly complained of, we should lay no stress on the dynamometer as a test of strength, as the instrument only registers the effort the subject puts forth—not necessarily the utmost he is capable of. Here it is wiser to make use of the fact that the *contraction of a voluntary muscle is associated with relaxation of its antagonist.* Thus, in the case of injury to the upper limb, if a man alleges weakness of the *flexor muscles of the elbow* we should adopt the following procedure: Bid him bend his elbow, and this with the utmost strength he can muster. Now, if at the same time we can by palpation feel that his *triceps* is hard and tensely contracted, we know that he is attempting to deceive; in other words, he has intentionally and forcefully innervated the *antagonist* muscle, the triceps—enlisting it to engender resistance to the effective action of the flexor muscles, and so to convey a false impression of flexor weakness.

To sum up, *persistence of marked atrophy with abnormal electrical reactions indicates failure or incompleteness, but restitution of volume and electrical responses point to the acquirement of functional adaptation.*

*Changes in the Bones.*—From a study of three thousand radiograms of fractures Imbert and Gagnière ascertained that osseous atrophy is the rule after (1) compound fractures attended by suppuration; (2) simple fractures with delayed union of the fragments.

This *lacunar* or *calcareous atrophy* of the bone—usually localized to the hand and foot—develops in sequence to injuries of the *bones, joints,* or *soft tissues.* It may be perceptible by

*radiography* in four months or not for several years after the accident (Sudec and others). It derives its importance from the fact that many months after a fracture—trophic troubles and muscular wasting having disappeared—the subject still continues to complain of *pain* and *inability to work*. Some observations of Von Winwarter render it probable that the disability is attributable to this atrophy. Thus he noted that when this lacunar atrophy was localized to one lower limb pains due to flat-foot often developed in the *uninjured* limb, owing to functional overwork thereof.

In any given case, therefore, of injury of the bones, joints, or soft tissues, if such calcareous atrophy exist, it is a sign that *functional adaptation thereto has not been accomplished.*

On the other hand, what are the radiographic appearances that indicate adaptation to the *sequelæ of a fracture*? Here some researches of Kempf supply the needed clue. From extended radiographic examination of the *callus* developed at the level of *fractures* he arrived at the following conclusions: *Opacity of callus* is an indication that the new formation is, as it were, still immature—unequal to the strains or stresses that devolve upon it. Thus, in fracture of the lower limb the *persistence of pains* should suggest radiographic examination. If the callus be found *opaque* it is objective proof that it has not yet adapted itself—is unequal to support of the body-weight.

On the other hand, if radiography reveal that the intimate structure of the callus resembles that of healthy bone in its *transparency*, its *clear bony trabeculæ*, it is a sign that *functional adaptation is achieved.*

*Other Structural Adaptations.*—Says the old adage, "Natura abhorret vacuum," and nowhere is this more beautifully illustrated than in the human frame. Thus if one of the fingers, notably the middle or ring, be lost, how unsightly the gap produced! Indeed, as we know, excision of the head of the metacarpal bone is sometimes invoked to conceal the disfigurement, this despite the drawback that it weakens the power of the hand for grasping, and so depreciates its functional capacity. And thus utility is sacrificed for appearance' sake. But though Nature's handiwork seems often clumsy, here is an instance in which she proves more deft than the surgeon; for slowly and surely with the passing years the fingers on either side approximate, the offending space dwindles—sometimes to vanishing-point. The same is observed if one or more toes be lost. Obliteration of the space is naturally quickened through exercise and work. When greatly lessened or wholly lost it speaks for *complete adaptation to the anatomical loss sustained.*

Structural adaptation is very clearly displayed, too, in *deformities met with in sequel to injuries.* Thus fractures of the ankle joint may result in *talipes equinus*; or the same may be the outcome of fixation during repair in a position of plantar flexion. If not corrected by operative procedure the deformity entails the weight of the body being borne on the distal end of the metatarsals when walking. As a consequence, not only do callosities form on the *ball of the foot,* but this region undergoes functional adaptation, viz. it becomes *abnormally wide.*

*Flat-foot* in its early stages, viz. when *flexible,* may be very *painful*; but if the distortion becomes *rigid,* with structural changes in ligaments and bones, the pain ceases and it becomes perfectly useful. In other words, the foot has undergone *functional adaptation.*

In *shortening* or asymmetry of the lower limbs, whether congenital or acquired, *adaptive tilting of the pelvis and deviation of the vertebral column* ensue, to the end of diminishing *lameness.*

If the *abdominal* muscles are *paralysed,* lordosis ensues—an instinctive attempt to balance the weight of the upper part of the body without entailing strain upon the muscles. In *hip disease with flexion,* too, a compensatory lordosis ensues, and the same in coxa vara, etc. In all instances the lordosis is an objective change indicative of the accomplishment of functional adaptation.

In short, as Sir Charles Bell puts it, "there never takes place any modification in the form of the parts of the body—whether the forehead, occiput, jaws, teeth, spine, pelvis, or extremities—without a corresponding adaptation extending through the whole skeleton."

Our inquiry up to this stage justifies us in concluding that—

(1) *Improvement of the objective state favours functional adaptation;*

(2) *Certain structural modifications indicate the acquirement of functional adaptation.*

But neither objective amelioration nor the presence of adaptive stigmata, either singly or combined, will afford us a basis for estimating the *degree* of functional adaptation attained. To establish this further and—from the nature of our quest—salient point we must investigate the functional capacities of the injured member.

## The Determination of Functional Capacities

From the economic standpoint *restoration of function,* not anatomical repair, is the important issue. Now the disabled or mutilated individual, to compass functional adaptation, has to acquire a certain habit of action, and this he attains by constant

repetition of a particular series of movements. At first this involves an *act of the will*, but ultimately the process of facilitation reaches a point at which conscious endeavour is no longer necessary, viz. it becomes *automatic*. In short, functional adaptation comprises two periods :

(1) The stage of *conscious* or *attentive* adaptation—of facilitation or progression ;

(2) The stage of *unconscious* or *automatic* adaptation—of realization or accomplishment.

Now, in attempting to appraise the measure of adaptation achieved in an injured limb it is essential that we, in the first place, determine the stage of evolution arrived at.

## Is Adaptation in Progress or Completed ?

The initial stage—that of acquisition—dates from the day on which the subject resumes work. It is in truth a period of probation, for there are few, if any, individuals who immediately on resumption of work can accomplish the same amount as before the accident. Sensitiveness has to be blunted, stiffness overcome, clumsiness and waste of energy obviated, all to attain the desired end—easy and effective motor adjustments. Now, as before remarked, this process of facilitation in the acquirement of new habits of action is gradual—in short, takes *time*. Indeed the German Imperial Office holds that adaptation is realized simply through *time* alone—this indifferently whether or no any objective change be demonstrable.

As to the exact *duration* of the strenuous novitiate, this, like the adaptive capacity of individuals, is variable ; for, as before observed, there are many factors, intrinsic and extrinsic, which favour, retard, or prevent the acquirement of adaptation. The German Imperial Assurance Office has, it is true, essayed the fixation of the period required for accommodation to various mutilations or disabilities ; but their figures show that the *time* necessary, even in *identical* lesions, varies widely, so many and diverse are the factors concerned. In truth, our knowledge of adaptation is but in its infancy. Much remains to be done before we shall be in a position to define accurately the factors wherewith to estimate the period of time required for habituation to a particular disability.

Two certainties, however, do emerge :

(1) *The longer the interval that has elapsed, the greater the measure of functional adaptation realized ;*

(2) *The periods required are much shorter when the subject receives a lump sum than when he is in receipt of an annuity.*

This latter and most interesting fact would seem to suggest that the German authorities attach exaggerated importance to *Time* as a factor in adaptation. That it is necessary is obvious, and, happily, the exigencies of *Life* are such that not even the vicious individual can wholly repress the instinctive tendency of the organism to adapt itself in course of time to altered circumstances. But the findings above cited clearly indicate that the achievement of adaptation is not so much a matter merely of time as of "moral imperatives." Is there the "will to win" whether born of necessity or a high sense of duty?

Despite our limitations—viz. inability to fix the period required for habituation to any given disability—we can at least decide whether the process is or is not complete. We may affirm that it is *incomplete*, has not reached its maximum, *if performance of the complex movements of readjustment still entail a conscious effort of will.*

From a practical point of view there should be no difficulty in arriving at a decision on this question, given joint inspection of the subject while at work, by the medical man and those responsible for his training. Such collaboration is highly desirable for appreciation of the technical difficulties to be overcome by the subject in pursuit of his vocation, and no less to ensure that any factors calculated to hinder adaptation be intelligently and sympathetically grasped and, if possible, ameliorated.

Throughout this period, when adaptation is in process of acquirement, the subject, whether industrial worker or disabled soldier, should, to ensure undisturbed concentration of his faculities on the process of re-education, be relieved as far as possible of all *financial* anxiety. In cases of *compensation* weekly payments should be continued, and *pensions* likewise, pending the time, not yet ripe, for their final assessment.

"Practice makes perfect," and in this sense there are no limits to the skill which may be attained by assiduous effort. But nevertheless the adaptive capacity has its limits, and sooner or later a day comes when in an *economic* sense the individual can progress no further. His lost functions have been wholly or partially regained. The exercise of the same has assumed a quasi-mechanical character, and *with the advent of automatism the high-water mark of adaptation is reached.* In other words, restoration of function is wholly or partially accomplished and *par passu* the industrial incapacity is either reduced to zero or persists in part. Here we reach the stage at which the measure of the residual capacity of the individual can be gauged—the powers that are left to him not only after exhaustion of all methods of treatment, but also of all latent capacities for functional

adaptation to the consequences of his original injury. This, then, is the time for final assessment, whether it be in the sphere of *compensations* or of *pensions*.

### The Economic Test of Adaptation

This is, of course, the criterion *par excellence* wherewith to determine the degree to which the victim's economic value has been prejudiced by his disability or infirmity. But determination of the individual's worth in the industrial market lies, we consider, outside the province of the doctor. His office is rather to appraise the nature of the anatomical loss, to determine the degree of disability imposed, and the measure of functional adaptation thereto that has been achieved. Estimation of the individual's economic worth in *compensation* cases is essentially a question for decision by the judge or jury, in collaboration with experts on the particular trade under review. Similarly, in the sphere of *pensions* the industrial value of the soldier should be gauged by the *lay* authorities, guided in this instance also by *technical experts*. We lay stress on the importance of invoking a *trade expert's opinion*, for to the uninitiated it may well appear that the disability is more incapacitating than it really is. One must be conversant with the nature of the work demanded of the individual. Again, the measure of depreciation occasioned by a particular disability varies in different trades.

Moreover, we have to view the earnings in the light of *economic fluctuations*. Thus it may happen that in the interval the rate of wages has undergone an all-round advance. It may well be, therefore, that a workman, while earning more than before his accident, may yet be earning less than his fellow-workers with whom previously he was on a level.

In this connexion the following pronouncement in the case *Dempsey* v. *Caldwell and Co. Ltd.*, 1914 (S.C. 28, 7 B.W.L.C. 823), is of interest: "The fact that owing to an extra local demand for labour in connexion with the execution of public works a workman who has lost portions of three fingers of his right hand is able to earn more than he was earning before the accident is not conclusive evidence of his ability to earn the latter amount in the ordinary state of the labour market, and this latter question should be carefully considered before putting an end to the right to compensation."

Again, it may be that the disability has entailed a drop in the workman's *industrial status*; in other words, he has in consequence thereof been relegated to a lower grade. Accordingly, after the accident, although his wages are on a par with

those of his comrades, they are less than they would have been had he been able to resume his former position in the industrial hierarchy.

Still, despite all these reservations, it must be admitted that the rate of the wages earned constitutes an excellent gauge wherewith to estimate the degree to which *adaptation* to the consequences of the disability has been realized. It may be taken that if the earnings are equal to those of workers similarly situated adaptation has been compassed.

This opinion derives support from the case *Pomphrey* v. *Southwark Press*, 1900 (1 K.B.C.C., 3 W.C.C. 194), in which it was decreed that "an award temporarily ending or suspending payments should be made where the workman is earning as much as before the accident and the chances of subsequent incapacity are not negatived."

The presumption is still more justifiable if the earnings have attained a higher level than before the injury was sustained. In drawing to a close this chapter we would emphasize the following :

(1) That functional adaptation is a biological phenomenon of great economic significance.

(2) That it may be regarded as Nature's own method of compensation.

(3) That though we have laid more stress on its operation in relation to *injuries*, its beneficent effects are equally prominent in the sphere of *disease*.

(4) That the determination of the degree of its realization shall form an integral part of the process of evaluation both in cases of compensation and of pensions.

(5) That the continuance of monetary allowances is indicated so long as the process of functional adaptation is *incomplete*.

(6) That the true measure of the *residual incapacity* cannot be estimated *until adaptation has reached its zenith*.

(7) That in the matter of *pensions* their fixation as *permanent* should be postponed pending the realization of such measure of functional adaptation as is possible in the particular case under review.

## CHAPTER XI

## PRINCIPLES OF EVALUATION

"REVENGE," quoth Bacon, "is a kind of wild justice which the more man's nature runs to, the more ought law to weed it out." In this wise saying of the old English philosopher we seize at once the salient flaw in all systems of primitive law. Alike in the Anglo-Saxon *Wergeld* or the ποινη of the Iliad, all forms of punishment were vitiated by intrusion of the passion of revenge.

To eliminate this taint of malevolence the principle of compensation was installed—viz. *as a substitute for personal retaliation.* "For as for the first wrong, it does but offend the law; but the revenge of that wrong putteth the law out of office" (Bacon).

The object of *compensation* is to place the injured person as nearly as possible in the situation he would have been but for the injury. The principle of the common law was that the amount of every injury might be estimated by *pecuniary* valuation. But the dictates of equity or fairness clearly pronounce that some injuries are unpaid and unpayable—complete satisfaction in all cases is not to be obtained by mere money payments.

Still the controlling principle is that compensation should be determined as far as possible by the actual amount of loss sustained by the individual. But how difficult, in injuries to the person, to make the damages a matter for exact calculation! In courts how impossible to restrain juries from awards which prima facie seem an index of their condemnation of the delinquent, the employer, rather than a true assessment of the reparation due to the injured person!

In the case of injuries to the person the damages sustained are twofold—of general and special character. The assessment, therefore, of the measure of incapacity entailed involves a dual consideration:

(1) Determination of the *general* damage—"the actual pain and suffering, including the nervous shock [but not wounded feelings], and the permanent or temporary character of the injury."

(2) Determination of the *special* damage—viz. of the consequences of the injury in relation to the vocation followed by the victim.

Upon the medical man, therefore, is thrust the responsibility of evaluation—of translating pain and suffering in arithmetical terms, of calculating the effect of permanent injury. It is his also to indicate more precisely the rôle played by the injured organ or member in the subject's occupation—its influence on his economic outlook.

It is upon the basis of his findings that the judge or jury is enabled to estimate the damage occasioned by the accident—to apportion the compensation due to the victim of mutilation, infirmity, and so forth.

Clearly, therefore, to fulfil his function, the medical man must be in a position to determine as precisely as possible the measure of depreciation the injured person has suffered in his working capacity. The problem is admittedly difficult—nay, impossible—unless we take as our criterion the salary the individual was able to earn prior to his injury.

Both under the Employers' Liability Act and the Workmen's Compensation Act this is the basis of compensation—*to assess by reference to the earnings of the injured person.*

## Contrasts between the Assessment of Compensation and Pension

The working capacity of the injured person is represented by his earnings. The measure of the decrease in his working capacity after injury is consequently represented by the resultant diminution in his earnings.

How, then, are we to express this reduction in working capacity ? By figures ranging from 0 to 100.

Let 100 represent the working capacity, and consequently the salary, of a workman prior to injury ; 0 will then represent absolute loss of working capacity with its correlated total loss of earnings. But if now the injury has occasioned, not total, but partial loss of his working power—i.e. has reduced his earning capacity by one-half, one-third, one-fourth, one-tenth—it follows that the decrease in his working capacity is equivalent to a reduction in his earnings of 50, 33, 25, or 10 per cent.

Or, put otherwise, let a man's working capacity prior to accident = 100. His earnings also = 100. After injury his working capacity = 80, his earnings also = 80. The resultant depreciation in working, i.e. earning capacity, = 100 — 80 = 20.

To sum up, in *compensation* cases the evaluation is an assessment in the *economic* sense. The criterion is the *earning capacity* prior and subsequent to injury.

But when we turn to military or naval *pensions* we are forbidden

to take any cognizance of the *previous earning powers.* In the assessment of pensions our evaluation is held to rest on a *physiological* basis. In the soldier we assess the damage that he as a physiological machine has suffered; in the industrial worker the loss that he as an earning machine has incurred. In the soldier's assessment we can only evaluate the general depreciation resulting from loss of bodily integrity, the reduction in physiological or functional capacity—the *absolute* damage; but in the industrial worker our assessment rests largely on *professional* as opposed to physiological capacity—the *relative* damage. This necessarily, for, even given identity of lesion, its influence on earning capacity differs widely in various occupations.

## Professional v. Physiological Evaluation

The same injury is far from having the same consequences in all men. Recognition of this fact constitutes the salient distinction of awards under the Compensation Act as opposed to those allotted under the Pension Warrant.

The *diminution of visual acuity in an eye, or even the loss thereof*, is relatively of slight importance to a labourer, navvy, or lumberman, the exercise of whose calling is largely a matter of brute force. *Relatively*, we say advisedly, for in like case how much more disabled the chauffeur or coachman—the man who for his work requires *binocular* vision.

Again, as Forgue and Jeanbrau observe, *loss of the terminal phalanx of the right thumb* in a labourer is not of prime importance, provided he retains the power of opposition; albeit the same would entail change of occupation to the typist or spinner, who to strike the keys or tie the skein requires the thumb intact.

Again, as these same observers remark, mutilations of the *left* are less grave than of the *right* hand. Nevertheless, in certain professions the left may play a rôle equally as important as, if not more important than, the right hand.

For the lapidary, the sculptor, it is essential that the *left* hand retain its suppleness, its prehensile capacities, unimpaired, for it is this same hand that holds, that directs the carving tool or chisel. On the contrary, for these same persons loss of a *lower* limb is less grave—especially so if the stump be good and serviceable, admitting of satisfactory attachment of an artificial limb, whereby standing and walking without fatigue are attained. But this same disability in a house-painter, a mason, a tiler, etc., would spell abandonment of their occupation.

To sum up, in cases of compensation for the effects of accident an attempt is made to *assess the consequences of the injury in*

*light of the profession or vocation followed by the victim.* But in pursuance of this end it naturally follows that, according to the calling, the compensation awarded even for identical disabilities varies within relatively wide limits.

Turning to "accidents of war," at what a disadvantage do we stand as compared with "industrial accidents"! In the latter instance we have, in the *occupation* of the victim, a criterion wherewith to appraise the particular loss he, *qua* individual, has sustained—viz. the *resultant depreciation in his economic worth.*

Nevertheless, our inability, in the matter of *pensions, to take cognizance of the previous occupation,* though regrettable, is seemingly held unavoidable. The sheer magnitude of the task forbids its attempt—the colossal number of men in the army, the diversity of callings, the wide disparity in *earning powers*! Moreover, one must recognize that the laity find it difficult to realize that to one man the loss of an eye or a leg is greater or less than to another. For them alike they are heroes twain, equally admirable, who have sustained an *apparently identical loss.* Both, therefore, must receive the *same monetary solatium.*

But, while fully alive to the difficulties that beset evaluation of pensions on the basis pursued in regard to "industrial accidents," what other course is open to us? Here some strictures passed by Broca on the French system of pensions, as in force at the commencement of the war, seem equally applicable to ourselves: "*The fact is that at the beginning of the war the instructions relative to pensions and invalidities were very badly conceived, and their authors singularly ignorant of what, since the law of industrial accidents, experts in civil courts have learnt.*" Says Broca in continuance: "One asks, moreover, what real difference there is between the two cases." Of a verity a shrewd question; for if it be justice to the soldier that we seek, then at least let us strive to apportion his award to his particular loss, each according to his needs. Is he not as worthy as the "industrial worker" of *differential* treatment? It is easier, no doubt, to allot pensions "by rule," but it lacks even the semblance of an attempt at equity.

As it is, we indemnify the soldier for depreciation of his *capacity for work,* the "industrial worker" for depreciation of his *capacity for skilled work.* Is this differentiation fair? All men have certain physiological or functional endowments, but what of their *acquired capacities*? What of the skill, the deftness, born of unremitting effort?—are these to count as naught in the balance? The man's work is the man, the developed man, as he is *now* in the living Present, not as he came into the world.

An " accident of war " has bereft him of this *acquired cunning* : surely herein lies his loss.

This mode of evaluation—without reference to the *previous vocation* or *earnings*—while it may be apposite to the old-time *professional* soldier, seems hardly so to the *citizen* soldier, the skilled worker drawn hurriedly from the factory or other sphere. There are without doubt certain typical cases—those comprised in the Schedule of Specific Injuries—the evaluation of which is, so to speak, automatic, but what of the ninety-and-nine without the pale ? Surely their assessment should be the outcome of an exhaustive clinical examination—one in which the experts should weigh impartially the case in all its aspects and, last but not least, *appraise the disability or infirmity in light of what it portends to the soldier picking up the threads of his civil occupation.*

## The Need for a "Guide Barème"

Now what objections, if any, are there to our taking as our guide the indemnities accorded for " industrial accidents " ? The salient drawback, we say, is the fact that *the findings of experts vary widely in regard to the effect on the working capacity of identical lesions.* Well may they do so, for the differences correspond to the individual variations presented, to the varied measure of reaction on the economic position.

We have heard some scoff at the meticulous care with which Continental experts weigh the relative effect on the industrial capacity of minor lesions, e.g. *ankyloses of one digit as opposed to another*—nay, *of individual joints of different digits.* But they have their reward : the more scrupulously just the awards, the fewer the loopholes for abuse. On the contrary, the less the measure of discrimination shown, the greater the injustice perpetrated.

But if *discrimination* be the controlling principle in *compensation*, lack thereof is characteristic of *pension awards.* Treat all alike, afford no scope for individual grievances : in this way equity is sacrificed to *uniformity.* The variations in the awards for identical lesions—typical of expert findings in courts of law—should be emulated rather than decried.

A more reasonable objection, however, that has been advanced is that *in general the evaluations are too high.* Not so if one considers them from the aspect of *professional* capacity, but only if one envisages the same from the point of view of the *physiological* or functional capacity.

The French Ministry of Pensions—in view of the colossal number of their disabled soldiers, and to the end of assisting

medical men to appraise after an accurate and more equitable fashion the measure of incapacity attaching to various disabilities and infirmities—have adopted the following plan, which, we think, might be advantageously copied by ourselves.

They have therefore, under expert advice, compiled a "Guide Barème." This has for its object *the standardization of awards corresponding to the reductions in working capacity entailed.* The estimates furnished by the "Guide Barème" have for their basis the similar decrees of civil legislation in "industrial accidents," the average of such awards being taken as a criterion. It should be understood that the estimates in the "Guide Barème" are only invoked for guidance in those disabilities or infirmities which cannot forthwith be held *as severe and incurable in all their elements.* In short, it does not apply to those disabilities or infirmities which, according to the French scale of gravity, are deemed *forthwith eligible for permanent pension.*

## Criteria in Evaluation

Under the Workmen's Compensation Act the injury to the person is assessed by reference to the *earning capacity.* The amount granted is subject to revision. The reassessment has for its end the increase, diminution, or abolition of the monetary allowance, according to the subject's condition.

Turning to military pensions, we catch an echo of this procedure only in the matter of *temporary* pensions. These are subject to revision up to the time at which they are declared *permanent.* The temporary pension, like a compensation allowance, may be increased, diminished, or withdrawn. Once, however, made *permanent,* it becomes immune from alteration save in the *direction of increase*—viz. in the presence of aggravation.*

Now in the revision of temporary allowances, and alike in the fixation of them as permanent, what are our bases of evaluation?

### *Objective State* v. *Function*

The essential soundness of assessment by reference to the *earning capacity* resides in the fact that the man's earning powers represent his worth in a *functional* sense; more strictly speaking, not only his capacity for work, but *skilled* work.

The true ideal of therapy is *restoration of function,* not mere anatomical repair. An example will best elucidate our meaning.

* As before referred to, by the Royal Warrant of 1918 the Minister of Pensions has power to review any pension in which the amount of the pension is in excess of the degree of disablement.

Not so long since a fractured limb was held to be cured once union of the fragments ensued; experience gained under the compensation laws, however, soon revealed the fallacy of this view, for even when union had occurred, the injured man did not immediately resume work. The necessary immobilization of the part brought its aftermath—pain, œdema, etc.; in short, *functional restoration* of the limb was not complete. It must be recognized, therefore, that *anatomical repair* is but the prelude to *functional recovery*.

Now in a simple fracture, given good alinement and an absence of complications, functional restoration may be complete; but in the presence of malunion, vicious union, or other unfavourable feature, functional recovery is correspondingly prejudiced. But even here the marvellous powers of *functional adaptation* come into play and industrial capacity is wholly or partially regained—this, moreover, often independently of any favourable modification in the *objective* state—viz. the anatomical lesion.

Clearly, therefore, from the *economic* standpoint, it is the *functional capacities* of the injured member or organ that should engage our attention. In investigating these aptitudes *the measure of functional adaptation that has been realized* will be revealed, and incidentally the *real* working capacity or incapacity determined.

### *Function the True Basis of Evaluation*

This is so true as to be almost a truism, and yet, as Julliard deplores, in nearly all countries the *objective* state is largely the basis of evaluation, of reassessment. This attitude (at any rate as regards compensation for injury) violates the controlling principle of the Act—viz. that reparation be determined as far as possible by the actual amount of loss sustained by the individual; in other words, *the measure of depreciation that has ensued in his functional or earning capacity*.

The mere fact that the injured person has no longer an intact organism does not, *ipso facto*, constitute a claim for compensation. This right exists only if the said injury or mutilation has resulted in a *diminution of the victim's earning capacity*. Such is the view of the German Imperial Insurance Office, which in serious mutilations accords an annuity proportional to the loss of earning capacity incurred by the injured person. Moreover, the monetary allowance is withdrawn or diminished if subsequently, by reason of *functional adaptation*, the beneficiary's earning powers have attained to or exceeded the level at which they stood prior to the injury. In short, the above authority, in accordance with the German Law of 1884, holds that *adaptation* must be regarded

as an amelioration of the consequences of an accident; in other words, it is an index of the measure of the victim's accommodation—*his habituation to his disability.* It cannot be gainsaid that these findings are in strict keeping with the underlying principle of compensation, *as assessed by reference to earning capacity.* The *diminution in earnings* suffered by the victim is compensated for by his *monetary allowance.* If, then, subsequently, through the medium of *functional adaptation*, his earnings reach their former level, his claim to compensation, *ipso facto*, disappears.

French tribunals, however, in *severe* lesions, do not take into account functional adaptation. In reassessment of such cases the question as to whether the monetary allowance shall be diminished, continued, or withdrawn is decided on the *objective* state at the moment of revision; in other words, its findings rest on whether the medical expert determines the presence or absence of any alteration in the objective or anatomical state. But by Article 19 of the Laws of 1898–1905 their tribunals have the power to take into consideration any diminution of the disability that may have ensued through adaptation. If the individual has attained his former salary by reason thereof, the claim to annuity ceases.

In the Italian Law of 1904, Article 13, it is expressly laid down that *alteration in the physical condition* of the victim—this, and this alone—justifies revision of the compensation allowance; but as in Italy compensation for injury takes the form of a capital sum, the question of adaptation is not taken into account—this for the very good reason that it would entail an impossible forecast, for, obviously, the ultimate disability entailed by an injury or disease requires for its precise estimation the passage of an adequate period of time. The influence on the earning capacity may be much less serious than was at first anticipated, or vice versa; pending elucidation on this point the measure of functional adaptation cannot be determined.

Under Swiss Law up to 1911 compensation, as in Italy, took the form of a capital sum, but in this same year, under a new law, compensation in the shape of an annuity was installed; and Julliard expresses the hope that functional adaptation to the consequences of disabilities or infirmities will now be taken into consideration. The new legislation provides that after fixation of the annuity the same, given any alteration in the working capacity, can be altered either in the direction of increase, decrease, or complete abolition. Moreover, revisional examinations can be invoked at any time during the first

*three* years, and subsequently at the end of the *sixth* and *ninth* year.

While the foregoing considerations justify Julliard in his contention that in all countries save Germany evaluation is largely based on the *objective* state, still the trend in all is in the direction of evaluation on the basis of *function*.

In Germany, as we have seen, the *adaptive capacity* is taken into account. Accordingly, in evaluation an effort is made to answer the salient question: *Has the individual become habituated to the consequences of his injury or disease?*—obviously the all-important point if we wish to determine with any precision the working capacity of the victim; for the industrial capacity clearly depends on the *functioning* of the organism, not on its anatomical state. The capacity for work may be said to be complete if the individual can execute all the functions demanded of him in the pursuit of his vocation—this even though he be the subject of an anatomical flaw. The point at issue is: What is the man's worth in a *functional* sense?

Now if we admit, as we ought, the principle of *progressive adaptation* as an essential element of *functional restoration*, it follows that the estimation of its measure of attainment should be undertaken at each revisional examination—this certainly if we are with any accuracy to counsel the increase, decrease, or abolition of the amount of compensation in any given case under review.

## Is Function the Basis of Evaluation in Pensions?

The question would appear to be permissible when we come to analyse the Schedule of Specific Injuries, for it is in no wise clear whether the evaluations are based upon "anatomical loss" or "loss of function."

The figures of evaluation, we are told, are of a "proportion corresponding to degree of disablement." This is as it should be, for disablement or disability signifies, not *anatomical loss*, but "weakness," "impotence," "a hindrance to action." We may assume, therefore, that the intent is to indemnify the disabled soldier for loss or depreciation of *functional* capacity. But it is when we come to analyse the different specific injuries that doubts intrude; nay, in some instances it becomes only too clear that the evaluation has been based on "anatomical loss" and not on "*functional* loss."

To take the *special sense organs*, e.g. the eyes. The degree of disablement corresponding to "total loss of sight" is rated at 100 per cent.; on the other hand, "loss of vision of one eye" is

assessed at 50 per cent. The uninitiated may be pardoned if they see in this particular sample of evaluation unmistakable evidence that it has been achieved on the basis of the anatomical loss or *objective* state, and not on function.

Nothing, too, may we add, could more clearly exemplify the fallaciousness—the inequity—of this method of assessment. The unhappy soldier who has lost two eyes is *blind*; if he has lost one eye he is *not blind*. Despite this startling difference—which apparently needs emphasis—the Pension Authorities proceed to the unjustifiable assumption that two eyes are only twice the value of one. (*Vide* section dealing with the eye.)

The schedule, too, is unhappily marred by "terminological inexactitudes." Take, for example, the expression "loss of an arm and an eye." What is here exactly meant? Is it loss in the *anatomical* or *functional* sense? Presumably the former, for elsewhere in the schedule the evaluation of ocular disabilities on a *functional* basis is clearly indicated by the phraseology "total loss of sight," and alike "loss of vision of one eye."

But to consider more closely the *ambiguity* of the expression "loss of an arm and an eye," two interpretations are open to us. Does it mean "loss of the arm" or "loss of the use of the arm"? The arm may be avulsed or amputated; or the limb, while retained, may be *functionally useless*. The distinction for the subject is not a matter of indifference. To be without an arm is bad, but it is questionable whether an incurably paralysed arm be not worse. In the latter instance the arm is not only useless, but an encumbrance—a flail-like appendage. Should the rate of evaluation not be correspondingly increased?

The same question arises in regard of the eye. Thus, is it *loss of vision* or *loss of an eye*? The difference to the victim is not unimportant. Obviously, if he lose an eye he loses its vision; but a man may retain the eye and yet lose its vision. In the former instance he sustains loss of vision plus *disfigurement*; in the latter, though *bereft of vision*, he incurs *no disfigurement*. Some difference, therefore, in evaluation seems indicated.

Now, if, as we have assumed, the evaluation of this dual lesion, "loss of an arm and an eye," is based, not on function, but on *anatomical* loss, it makes no provision for the following contingency: How are we to assess the man who has lost an arm and not lost an eye, but the *vision* thereof?

Clearly, on the *anatomical* basis no assessment of the latter disability is possible—it must be assessed on *function*. Accordingly, the bases of evaluation in a dual lesion of this nature are not, as they should be, *identical*. The *arm* is assessed on an *anatomical*, the *eye* on a *functional* basis. This mingling of

anatomical and functional bases of evaluation is to be deplored ; they are not translatable one in terms of the other. Anatomical values and functional values are not identical, for no constant correlation obtains between the anatomical or objective state and the functional or industrial incapacity.

To continue our consideration of further items in the schedule, we are given the official evaluation of " loss of both hands "—viz. 100 per cent. But, strange to say, in no instance is the rate of assessment for the loss of *one hand* furnished. This omission should, we think, be rectified. We are, it is true, vouchsafed the somewhat obvious note that " *in the case of left-handed men, certified to be such, the compensation in respect of the left arm, hand, etc., will be as for a right arm, hand, etc., and vice versa.*" So far, so good, but what we want to know is whether any difference in evaluation obtains in regard to the *right* and *left* hand, and this respectively in *right-* or *left-handed* persons. Some distinction must be made, for, save in the rare event of *ambidexterity*, one limb is in a functional sense of greater value than its fellow, and this, the active limb, may of course be the right or left in any particular individual under review.

In extenuation it may be said that the schedule does recognize a difference between the two *limbs* as exemplified in the series of *amputations* specified. Thus, amputation of the right arm below the elbow is valued at 60, that of left arm below elbow at 50 per cent. (*Vide* chapter on " Amputations.")

The same differential evaluation obtains in amputations of the arm at higher levels. Thus, amputation of the *right* arm at the shoulder-joint is valued at 90, of the *left* arm at 80 per cent. ; of right arm above or through elbow at 70, of the left arm at 60 per cent.

To turn to Continental authorities, Remy, the great French expert, estimates the loss of the *right hand* at 60, that of the *left* at 48 per cent. ; Thiem, a notable German authority, values the loss of the right hand at 66, that of the left at 55–60 per cent.

It is therefore, we think, to be regretted that in the Schedule of Specific Injuries no evaluation of loss of the *hand per se* is vouchsafed—no differential assessment of the value of the right and left hand in right- and left-handed persons respectively.

Loss of *one foot* stands in quite a different category, for, each being equally essential for support of the body-weight, the loss of two being placed at 100, the loss of one may with fairness be rated at 50 per cent.

The term " loss of the thumb," too, lacks definitude. Does it include, not only the loss of the two phalanges, but also of the *metacarpal* bone ? In both German and French schedules a

higher evaluation is accorded when in addition to the two phalanges, the *metacarpal* bone is also wanting. But, from the point of view of the soldier, it must be admitted that the evaluation accorded "loss of the thumb" in the English schedule is so much more generous (40 per cent. in right, 30 per cent. in left) than that accorded by Continental authorities that he loses nothing through this indefiniteness of nomenclature.

The term "total paralysis" calls for amplification—or, rather, qualification. Technically speaking, such a condition is incompatible with life! Does it denote *paraplegia, paralysis of all four limbs,* or what?

Again, is the paralysis of *functional* or *organic* nature? In other words, is it *ephemeral* or *permanent* in character? The word "total" supplies no indication, and, without undue carping, the adjective is wholly unsuitable, for, from the point of view of the eligibility of the condition for permanent pension, it is not the fact that it is "total" that qualifies it for this same, but that it is *permanent* in nature. It may be "total" and yet purely *functional*—liable to cure with dramatic suddenness! Obviously, if assessed purely on the basis that it is "total" many a case of *functional* paralysis would forthwith be entitled to *permanent* pension, whereas clearly only such forms as are of established *organic* origin should be included in this category.

Contrast this indefinite and unscientific nomenclature with that of the "Guide Barème" issued by the French Ministry of War. Not only does it differentiate the evaluation of *cerebral* as opposed to *spinal* paralysis, but it goes still further in that the assessment is also graduated in accordance with their *complete* or *incomplete* character.

Similarly, the vague phrases "lunacy," "total loss of speech," "total deafness" are all open to the same reproach—lack of definitude. Here again, in regard of the two latter, it is not the fact that they are "total," but that they are *permanent* in nature that qualifies them for inclusion in the schedule.

But, even at the risk of being thought captious, we must submit that in the matter of vagueness the authorities have eclipsed themselves in regard to the condition termed in the schedule "facial disfigurement." Thus two types are distinguished: "severe facial disfigurement" and "very severe facial disfigurement"—the former assessed at 80, the latter at 100 per cent. What is the basis of differentiation? Is it determined wholly on *æsthetic* considerations?—for, obviously, severe facial disfigurement may be quite compatible with unimpaired working capacity. But for the guidance of the medical man it is essential that some criterion be established for the evaluation

of such cases, and in a later section on " Scars " we have attempted to deal with this difficult question.

It would, however, serve no useful purpose to consider the further items in the schedule, for it is with the underlying *principles of evaluation* that we are chiefly concerned.

The essential flaw to our mind in the schedule consists in the fact that it is not clearly laid down whether the evaluations have been arrived at on an *objective* or *anatomical* as opposed to a *functional* basis. To evaluate on the former is not only essentially unsound, but it violates the wish of the pension authorities —viz. that assessment should be based on " the degree of disablement." This can only be attained by evaluating on the basis of *function*. How otherwise can we estimate the measure of disablement ? On an *anatomical* basis, for example, the loss of a *thumb* is no more than the loss of a *finger*, but estimate it in the light of *function* and immediately the profound difference in the loss sustained becomes apparent.

Apart from the irrational nature of *anatomical* evaluation, the limitations it imposes on us should deter us from any obsession in this direction. Crude losses of limbs or organs—involving as they do *total loss of function*—lend themselves temptingly to arbitrary evaluation. But what of *partial* losses of *function*—grades of incapacity ? These constitute the majority of cases that come up for pension. Here the estimation of *function* alone avails us. If it be an injured eye or ear we cannot evaluate on the *anatomical* condition—the opacities in the lens, the sclerosing otitis. No. *What can the man see ? What can the man hear ?*—This is the measure of his disablement.

Similarly, in the injured limb it is not the *anatomical* state thereof, but *what is its functional worth ?*—what can the man do with it ? The same in regard to the *internal organs*—the damaged heart, lung, or kidneys. We must not be obsessed with our auscultatory or radioscopic findings. Undeniably they have their uses. But we cannot measure the degree of disablement on the evidence thus afforded. We have to estimate it by the practical criterion of how far the functional efficiency of these various organs has been compromised.

## MULTIPLE DISABILITIES

Not the least of the horrors attendant upon modern warfare is the number of unfortunate soldiers who have sustained, not one, but many wounds—not loss of one, but of two or even more limbs. Upon what basis, then, are we to proceed to evaluate in their totality the consequences of such several injuries ?

Turning to the sphere of *industrial accidents*, it is true the victims thereof may incur, not one, but several lesions. But the relative paucity of such cases admits of their individual consideration by judge or jury. Their consequences can be weighed in the light of the subject's *occupation* and the degree of his disablement apportioned accordingly.

Despite, however, the inherent justice of this method of procedure, it does not lend itself readily to generalizations; in other words, the wide disparity in the awards, whether for single or multiple injuries, constitutes an obstacle to standardization. It is, as before observed, a *professional* as opposed to a physiological evaluation. So it is that when we come to consider *multiple disabilities in relation to pensions* we derive little or no aid from the decrees of *civil legislation*.

Inasmuch as, however, the system of *pensions* antedated by decades the installation of compensation, Ministries of War or equivalent bodies had long since been confronted with this problem of evaluating multiple lesions. The relatively large number of claimants prohibited all possibility of their individual consideration. Accordingly, to attain uniformity, though not discrimination, in their awards, they resorted to *arbitrary evaluations on a flat rate*.

Their earlier efforts in this direction were naturally somewhat crude. In the schedule embodied in, for example, the Royal Warrant of 1829 there was no attempt at estimation of the degree of disablement in *percentages*; they were content to graduate the monetary awards after a very autocratic and unintelligent fashion. Indeed, the first endeavour at scientific evaluation in "proportion to the degree of disablement" was delayed till the outbreak of the present hostilities, though Continental Ministries of War had long since attained some measure of *standardization*. We have only to compare the meagre Schedule of Specific Injuries in our own Pension Warrant of 1829 with that existing under the French Ministry of War in 1831.

With this brief prelude, it will now, we think, be advisable to enumerate the various multiple disabilities comprised in the Schedule of Specific Injuries, with their proportionate degree of disablement.

| Lesion | Proportion of degree of disablement |
|---|---|
| Loss of two or more limbs | 100 per cent. |
| „ an arm and an eye | 100 „ |
| „ a leg and an eye | 100 „ |
| „ both hands, or of all fingers and thumbs | 100 „ |
| „ both feet | 100 „ |
| „ a hand and a foot | 100 „ |

| Lesion | Proportion of degree of disablement |
|---|---|
| Total loss of sight | 100 per cent. |
| „ deafness | 70 „ |
| Loss of four fingers of right hand | 40 „ |
| „ three fingers of right hand | 30 „ |
| „ four fingers of left hand | 30 „ |
| „ two fingers of either hand | 20 „ |

*Analysis of the above Table*

Study of the above combined lesions in the light of their respective evaluations discloses no *uniformity* as to the basis of assessment. In some instances it is clearly arrived at by the simple process of *adding together the values accorded the individual lesions when they occur in isolated form.* Thus the loss of one eye is valued at 50, that of two at 100 per cent. Similarly in the case of both feet—loss of one at 50, of two at 100 per cent.

But in regard to other multiple disabilities this primitive method—which has at least the element of simplicity—is perforce departed from. We use the word " perforce " advisedly, for *by the terms of the Royal Warrant the maximum degree of disablement is fixed at* 100.

Thus, for example, the " loss of an arm and an eye " *is assessed at* 100 *per cent.* Now, taking these two lesions individually, we find in the schedule that the " loss of an arm " (amputated at the shoulder-joint) is evaluated at 80–90, " loss of an eye " at 50 per cent. Presupposing the dual lesion to occur in the same individual, if, then, we proceed to add together these values the sum total will exceed the maximum (100) by 30–40 per cent. The same holds good in the " loss of a leg and an eye."

We cannot, therefore, when dealing with multiple disabilities, simply *add up the percentages of disablement accorded each individual lesion*, because we should perpetually find ourselves in the position of *exceeding the maximum.* This latter was obviously the stumbling-block that the authorities had to overcome, and in this impasse they seem to have taken the easiest way out of the difficulty, for all *dual or multiple lesions of a grave nature*—whether involving the *limbs, eyes,* or *internal organs—were forthwith allocated to the highest category.* This conclusion seems inevitable, for when we analyse *seriatim* the various multiple disabilities and their associated figures of evaluation it is impossible to discern by what *arithmetical* process they were arrived at—much less can we determine whether their assessment was reached on a basis of *anatomical loss* or *loss of function.*

Accordingly, to our mind, the assessor may look in vain to

the schedule for any guidance in his attempt to evaluate any of the myriad multiple lesions not comprised within its limits. It remains, therefore, for us to indicate the broad principles on which to approach the assessment of this class of case.

## Possible Ways of Evaluating Multiple Disabilities

The disadvantage of attempting to evaluate single lesions on an *anatomical* as opposed to a *functional* basis is, if anything, accentuated when we come to assess *multiple* disabilities. The key to the solution of the problem resides in the recognition of the following:

*The nature, not the multiplicity, of the lesions determines the "degree of disablement" occasioned thereby.* In other words, the "degree of disablement" does not necessarily increase *pari passu* with the number of individual lesions. This being so—viz. that *no constant correlation obtains between the number of lesions and the functional incapacity*—we see that we are perforce driven to appraise the measure of the latter, in light of the extent to which the *functional* aptitudes of the *limb* have become impaired. In the light of these pronouncements we may now proceed to denote the ways in which evaluation of multiple disabilities may be approached.

### *Multiple Lesions in a Single Limb*

To begin with, we must, as our basis, recollect that the *maximum degree of disablement in a limb is fixed by the Warrant*, and cannot be exceeded. Thus, loss of the right is rated at 90, that of the left arm at 80 per cent., while in the lower limbs the loss of each is assessed at 80 per cent. In other words, these figures postulate *total incapacity* of the limb.

Now, this result may be attained by—(*a*) one grave lesion, or (*b*) two or more lesions of lesser gravity the cumulative effect of which is this same end-result—total incapacity. An extensive lesion of the brachial plexus resulting in *total paralysis* of the limb supplies an illustration of our first group (*a*); but much more intricate are the questions arising in regard to group (*b*).

Thus, for example, given a *lesion in the forearm* causing paralysis of the hand, and in addition one or more *wounds of the fingers* with resultant *ankylosis of several joints*, how shall we evaluate this complex? Clearly not by adding together the values accorded the individual lesions and taking the sum total as the measure of the victim's disablement. No; we must view it in the light of *function*. The hand *qua the nerve lesion* is, functionally speaking, *hors de combat*. That there are also

*ankyloses* present is a misfortune, but they as such do not increase the measure of the already existing loss of functional efficiency.

Now, in our own Schedule of Specific Injuries "loss of the hand" *per se*, whether right or left, is not codified; but taking the approximate valuation, that accorded *amputation* of the right or left arm *below elbow*, we find these are rated at 60 and 50 per cent. respectively. This may be taken as a fairly correct assessment; for Imbert, analysing a long series of Continental evaluations for the loss of the right and left hands, determines an average of 65 and 55 per cent. respectively.

Still, there are many instances in which the determination of "total incapacity" is arrived at by adding the *partial incapacities* occasioned by multiple lesions. Thus, for example, the loss of *two* fingers is assessed by adding together the values accorded each *single* digit. In our own schedule the "loss of two fingers of either hand" is assessed at 20 per cent.—a generous estimate, as most Continental evaluations for the loss of a *single* digit range from 3 to 10 per cent.

In reviewing the foregoing paragraphs we see that in our first example (a dual lesion—viz. of the *forearm* and *fingers*) the assessment was conducted, and rightly so, on the basis of loss of *function*. On the other hand, in the second example (loss of *two fingers*) the evaluation was determined on an *anatomical* basis. The very vagueness of the phrase "loss of two fingers of either hand" carries conviction on this point, for the varying *functional* values of the different digits as opposed one to the other are wholly overlooked.

This lack of uniformity as to the basis of evaluation is much to be deplored. Moreover, as regards the particular lesion under consideration—e.g. *loss of digits*—this evaluation on an *anatomical* basis is peculiarly unhappy, for obviously the measure of disablement occasioned by the loss of the *index* and *middle* exceeds that entailed by the loss of the *middle* and *ring* or *ring* and *little* fingers respectively.

In the French "Guide Barème" *the loss of individual digits* is evaluated in accordance with their *varying functional value*; in addition the loss of *two* or *more* digits is also treated *differentially*, and in this way the varying measure of disablement imposed is correctly assessed.

It is to be urgently hoped, therefore, that the Ministry of Pensions will emulate the discrimination displayed by those responsible for the compilation of the French "Guide Barème." The interests of the soldier imperatively demand such alteration.

In view of the complexity of the subject it has occurred to us that the adoption of some *formula* for calculating the degree of

disablement occasioned by *multiple* disabilities might prove serviceable.

In light of our limitations as imposed by the schedule (maximum degree of disablement = 100 per cent.) it is clear that the result obtained by the application of the formula must fulfil the following postulate : *The degree of disablement must never exceed* 100 *per cent.*

Presuppose that a man be the subject of *multiple* disabilities, and the degree of disablement due to each separately be represented by $x$ per cent., $y$ per cent., $z$ per cent.

Let $x$ denote $1-\frac{x}{100}$, $y$ denote $1-\frac{y}{100}$, $z$ denote $1-\frac{z}{100}$, so that $x\ y\ z$ denote what might be termed the capacity of the man after each disablement. Then the generalization of the formula which gives the joint degree of disablement occasioned is $100 \times (1 - x\ y\ z)$ per cent., i.e. the rule is, Find the product of the various capacities, subtract the product from 1, and multiply the result by 100.

E.g. (1) a man has three injuries, each producing 20 per cent. disablement.

The capacities are each :

$$1 - \frac{20}{100} = \frac{4}{5}$$

The joint degree of disablement is :

$$100 \times \left(1 - \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5}\right) \text{ per cent.}$$

$$= 100 \times \left(1 - \frac{64}{125}\right) \text{ per cent.}$$

$$= 48{\cdot}8 \text{ per cent.}$$

This is, of course, less than the sum of the separate disabilities—viz. 60 per cent.

Or (2) a man has four injuries producing 20 per cent., 30 per cent., 40 per cent., 50 per cent. disablement respectively.

The capacities are :

$$1 - \frac{20}{100} = \frac{4}{5}, 1 - \frac{30}{100} = \frac{7}{10}, 1 - \frac{40}{100} = \frac{3}{5}, 1 - \frac{50}{100} = \frac{1}{2}$$

The joint degree of disablement is :

$$100\left(1 - \frac{4}{5} \times \frac{7}{10} \times \frac{3}{5} \times \frac{1}{2}\right) \text{ per cent.} = 100\left(1 - \frac{84}{500}\right) \text{ per cent.}$$

$$= 83{\cdot}2 \text{ per cent.}$$

In regard to the above formula it has the advantage of being simple and easy of application, and, moreover, as we think, enables the assessor to arrive at a fairly approximate estimate of

the sum total of the functional disablement occasioned by the multiple lesions.

The salient points of the formula are :

(1) It gives the *total* degree of disablement as rather *less* than the *sum of the separate disabilities*, but in the case of *minimal* incapacities the *total* degree of disablement is only very slightly *less* than the *sum of the individual disabilities* when added together.

(2) It never gives a disablement in excess of the maximum —viz. 100 per cent.

In conclusion, it may, we think, be claimed for the formula that it affords a fairly simple method of dealing with multiple disabilities, and one, moreover, that gives consistent results. This, of course, only in the case of disabilities located in *one limb*, and the figures obtained are, we think, reasonably fair both to the taxpayer and the pensioner. But in the case of multiple disabilities such as the *loss of two eyes*, it is obviously unfair to the latter, and we would emphasize the inapplicability of the formula for the assessment of this or similar lesions. It may, of course, be urged in respect of this as of any other formula, that it is " convenient " rather than " correct." But as for its relative correctness or incorrectness, is it any more so than, for example, the English and French assessments for the loss of an eye ? In our own country the *loss of an eye* is estimated at 50 per cent., in France from 25 to 33 per cent.—can *both* be correct ?

### *Multiple Lesions distributed over Two Limbs*

Under this heading several types of *localization* will have to be considered. Thus the lesions may be situate in—(*a*) both arms ; (*b*) both legs ; (*c*) an arm and a leg. In regard of these combined injuries it will, of course, be understood that the degree of disablement can in no case exceed 100 *per cent.*, and with this reservation we now proceed to discuss these associated disabilities.

Presupposing the lesions to be situate in *both arms* or *both legs*, all will depend on their *nature* and *relative gravity*. Thus, one may be the site of a mutilation qualifying forthwith to *permanent pension* ; the other the seat of a lesion the resultant disablement from which may be rated *below* 20 *per cent.* In this event the schedule stands us in good stead, the *amount of the pension is fixed*, and all that remains is to compound for the minor lesion by a capital sum or *gratuity*.

But many varieties of multiple lesions distributed over two limbs are not codified ; notably is this so in the case of *ankyloses*. Thus, to take an extreme case—both wrists fixed in *acute flexion* : Now, the average evaluation for fixation of *one* wrist in this

position is 35 per cent. It cannot be gainsaid that merely to double this amount and award 70 per cent. is inadequate—this for the reason that both arms are similarly crippled and neither can supply the functional defect of its fellow. Consequently, we think it only fair in such cases to add 10, and award 80 per cent.

Take the opposite extreme: *symmetrical* ankylosis of the knees in a *favourable* position. An *isolated* disability of this nature is evaluated on an average at 30–40 per cent. If such does not entail a change of occupation we feel that an adequate assessment of the *dual* lesion would be 70 per cent.

Passing now to consider lesions localized *one in the upper, the other in the lower extremity*, two varieties of distribution are, obviously, possible—*homo-* and *hetero*-lateral; in other words, the right arm and right leg may be the seat of injuries, or these latter may be of crossed distribution—viz. in the right arm and opposite leg, or vice versa.

Now, does the localization of the lesions on the *same* or *opposite* sides mitigate or aggravate the resultant degree of disablement? Unquestionably, in the opinion of Remy, the French expert, a man who has lost either his right arm and leg or his left arm and leg is at a disadvantage with the individual who has lost a *right arm and left leg*, or vice versa. But in our own, as in the French schedule, no distinction is drawn whether the loss of limbs is on the *same* or *opposite* sides of the body; both alike pass into the category of *total incapacity*.

Turning from the consideration of mutilations to that of *minor lesions* distributed over two limbs, we are inclined to take up the following position. In cases in which the lesions are situate on *opposite* sides of the body—i.e. the right arm and left leg, or vice versa—we would add the respective values of these lesions when occurring in isolated form. Thus, suppose the upper limb to be the seat of a partial ankylosis of the shoulder (25 per cent.), and the lower of a paralysis of the external popliteal nerve (15 per cent.), the evaluation of the degree of disablement would be 40 per cent.

On the other hand, if the lesions occur on the *same* side of the body, we think some *additional degree of disablement* should be conceded. In this event we would not only add together the respective values of the isolated lesions, but increase the sum total by 5 to 15 per cent.

*Multiple Lesions involving a Limb and a Sense-Organ*

Assume that a man has lost the *vision of one eye*, and in addition has sustained the *loss of two fingers of one hand*: in our schedule the former disability is rated at 50, the latter at 20 per cent.

Now, we have in a mixed lesion of this nature to consider whether or no what may be termed the *principle of substitution* obtains; that it does hold good in the example under review is obvious on reflection, and not the least of the flaws in our schedule is that it fails to take cognizance of this beneficent power of *adaptation*. A man who has lost the vision of *one* eye becomes with time, though not indifferent, more or less oblivious of his loss; in other words, the *opposite* eye comes to the rescue.

To rate the loss of vision of *one* eye at 50 per cent. is therefore excessive, and in no country other than our own is it assessed at more than 25–33 per cent. Now, given the Continental rates of evaluation, the total degree of disablement admitted for the above lesion—viz. loss of vision of one eye and loss of two fingers of one hand—would be, by the process of addition of individual values, 45–53 per cent.

Evaluated by our own scale, the degree of disablement would reach the much higher level of 70 per cent. How excessive this is is readily realized when we have regard to the content of the third group of our schedule. Can any one possibly maintain that a soldier afflicted with "total deafness," or "the subject of a short-thigh amputation with pelvic band," or "of the left arm at shoulder joint," or "of the right arm above or through elbow," is only disabled to the same degree as the man who has lost the vision of one eye and two fingers of one hand?

Clearly, the *totally deaf* man is much more inconvenienced; for that matter, too, so are the victims of all the other lesions cited. Each and all have suffered, to say the least of it, a grave *mutilation*, whereas the man who has lost the *vision of one eye*, though not the eyeball, may be in no wise mutilated. The *loss of his fingers* may, needless to say, be not obtrusive, and with the passing years the unsightly gap left becomes gradually lessened to vanishing-point.

We see, therefore, that by this too elevated rating of the loss of *vision of one eye* multiple disabilities *involving an eye and a limb* tend, as a consequence, to be too highly assessed—this because in our own schedule the *principle of substitution* is given no weight; when it is taken into consideration *simple addition of the individual values accorded the lesions* is fair and just. Accordingly, we trust that when the Schedule of Injuries is

revised the *loss of vision of one eye* may be evaluated at 30 per cent., and the above anomaly removed.

*Evaluation in the Presence of Pre-existing Lesions*

Cases in which individuals, the victims of *pre-existing* lesions, have subsequently sustained further injuries call for a brief discussion. That blemished individuals have secured entrance into the Services is, of course, undeniable, but here we can only allude to the principles which should determine our evaluation of such cases. Fortunately, the decrees of civil legislation afford us some guidance.

Thus, tribunals generally admit that, if a *one-eyed* workman incur the loss through " industrial accident " of his remaining eye, he should receive compensation corresponding to the *total incapacity* thereby produced. While possessed of *one* eye he had a certain working capacity ; losing the remaining eye, he is bereft of this capacity. It matters not if the loss of the first eye was or was not the outcome of an " industrial accident." The important point is whether the loss of his *remaining* eye was the result of an " industrial accident." If so, the *total incapacity* is referable to this said accident and the responsibility of the employer is total. Presumably, if a *one-eyed* individual gain *entrance to the Services* and, through a wound or other circumstance attributable to military service, lose the vision of his other eye, he would be placed in the category of *total disablement*, and his pension be rated accordingly.

Doubtless interesting problems will arise when, *after discharge from the Service with pension* for loss of, for example, *one* eye or *one* hand, the quondam soldier subsequently incurs loss of the *remaining* eye or hand through an " industrial accident."

As to whether in the case of the discharged soldier the fact that he already enjoys a pension for the loss of one hand should be taken into consideration in assessing the amount of *compensation* accorded to him for his total incapacity is without our scope.

Take another instance. A man *emmetropic in one eye with lowered visual acuity in its fellow*, the result of a previous affection, gains entrance to the Service. He loses the vision of his emmetropic eye. He does not stand in the position of the *totally blind*, and the only fair solution is to graduate his pension in accordance with the measure of visual acuity that he retains.

Turning now to the sphere of the *limbs*, it has not infrequently happened that a workman who has previously been deprived of *one hand* subsequently loses *one or two fingers* of the remaining

member through an " industrial accident." In such a case it is only fair to allot an *increased value to the lost digits*—this in view of the previous loss of his other hand. Forgue and Jeanbrau quote the case of a one-handed workman who subsequently lost two fingers of the remaining hand in an " industrial accident." The tribunal, in place of the 25 per cent. usually allotted to a sound workman, increased this figure to 35 per cent.

### *Absolute Incapacities*

Dealing as this work purports to do, with the evaluation of incapacities, not only in relation to pensions, but also in reference to *compensation*, a brief digression on the above is not redundant. As regards *pensions*, the Schedule of Specific Injuries has enumerated the particular mutilations or disorders or combinations of such as entail " total incapacity."

Turning to the sphere of " industrial accidents," Mourral and Berthiot hold that all injuries or morbid disorders, the existence of which is incompatible with the performance of all useful work, and which exclude the victim from following any vocation, should rank as *permanent total incapacities*. The principal causes of such, according to these experts, are the following :

(*a*) Blindness or depreciation of physiological visual acuity below 0·1 (Truc.).
(*b*) Loss of two limbs (two arms, two legs, a leg and an arm).
(*c*) Paraplegia of organic origin.
(*d*) Non-compensated cardiac lesions.
(*e*) Mental alienation.
(*f*) Cerebro-spinal concussion with serious and incurable sequelæ.

Imbert, who likewise concedes the foregoing as entailing permanent total incapacity, would relegate to the same category also incurable diseases (cancer, tubercle, leukæmia, etc.), high grades of hystero-neurasthenia, and spinal lesions involving paralyses of the lower limbs with or without contractures.

While, generally speaking, all tribunals admit that *loss of two limbs* predicates " total incapacity," some experts, notably Forgue and Jeanbrau, consider that automatic relegation of these cases to the above category is scarcely justifiable. They admit, for example, that given the loss of the *two lower extremities*—the two upper limbs being intact—a state of *total* incapacity must be admitted when the workman has to relinquish his previous occupation and is too old to take up another.

On the other hand, they hold that the loss of the *two lower limbs* does not constitute " total incapacity " if the workman is

in the prime of life, possessed of reasonable intelligence, and capable of learning a new trade. Still, it is clear that even with these reservations the compensation should be of high grade. Thus, take the two following instances :

A workman, aged twenty-eight, suffered amputation of both legs below the knees ; another, aged thirty-two, incurred amputation of the left leg and of the right thigh in its upper third. In both cases the reduction in working capacity was by the Seine Tribunal in 1908 evaluated at 90 per cent.

For ourselves, we are inclined to suggest that in the case of the former or similar grave mutilations a state of total incapacity may with fairness be assumed. Some French experts have in such cases appraised the reduction in working capacity at 98 per cent. ; but to our mind it is impossible to draw such fine distinctions—to maintain that the reduction of working capacity is only 2, 3, or 4 per cent. short of total incapacity. If doubt there be in such cases, the benefit thereof should certainly be in favour of the claimant.

In this connexion it should be realized that only very rarely, if ever, is loss of *one* limb held to predicate *permanent total incapacity*. Nevertheless, the evaluation of such requires to be carefully considered, not only in the light of the occupation, but also the age and intelligence of the claimant.

Thus, in 1902 the Court at Riom held that amputation of the *right forequarter* entailed permanent total incapacity—this because the subject was aged, illiterate, and unable to follow any useful occupation.

In conclusion, we have one suggestion to make in regard to the compensation allotted to the *totally incapacitated* workman. If the condition is such as calls for constant supervision, as in the totally blind, or, as in the totally crippled or paralysed, unremitting attention by one or more persons, the amount granted should be increased.* In Germany the compensation for such cases attains the level of 125 per cent., and in the French Chamber of Deputies the need of more adequate compensation for such unfortunate persons has been emphasized, and alteration in the existing law to this end formally advocated.

* Such is allowed in regard to the pensioned soldier, as witness article 6 (*a*) of the Royal Warrant: " In addition to any pension awarded under the foregoing articles there may be granted, under such conditions as the Minister of Pensions may determine, to or on behalf of a man disabled in the highest possible degree, an allowance not exceeding 20s. a week in any case where the constant attendance of a second person is necessary."

*Evaluation of Minimal Incapacities*

The question whether minimal incapacities should be compensated raises some interesting points for discussion. We have, in the first place, to consider our limitations in a *professional* sense—in other words, the fact that it is practically impossible for a medical man, or even a technical expert, to affirm categorically that this or that slight disability determines a *reduction* in the earning powers.

Thus, to take an example: Suppose that a workman as the result of an "industrial accident" lose the *terminal* phalanx of the left or right little finger, or suffers ankylosis in a favourable position of some one or other *interphalangeal* joint. If we admit that he sustains an incapacity thereby, as generally allowed, of 1, 2, or 3 per cent., it is to all intents and purposes a very arbitrary estimate, and if such a figure be translated into terms of his loss in weekly wage it is almost negligible.

In regard to the above or similar *minimal* lesions the inconvenience sustained is ephemeral. *Anatomically* judged, the ankylosed digit still remains fixed and unchanged, not so the *functional* impairment of the victim's hand. We know it is not so: only for a time is he consciously hampered. Not only do the thumb and other digits, but, more, the limb as a whole conspires to supplement or make good its impaired or lost aptitude: all this, be it remembered, though the joint yet remains *immobile*. The ends to be achieved are still attained, but in a different way—clumsily it may be at first, but anon deftly and automatically through the beneficent medium of adaptation. A fortiori, how much the more speedily will this ensue if the joint be not ankylosed, but merely *stiff*—the seat of some lesion capable of amelioration.

Secondly, we have to consider whether it is in the best interests of the workman to compensate *minimal* lesions. All surgeons familiar with the life-history of minor injuries before and after the introduction of compensation have been impressed with the disadvantages that attach to indemnification of trivial injuries.

Unquestionably, some workmen—obsessed with the idea of compensation—make little or no effort to adapt themselves to the consequences of such disabilities. They prolong their absence from work long beyond the time necessary for recovery in *non-assured* persons. Idleness is the mother of many vices, and not the least of these is alcoholism. Finally, if abstention from work be permitted for any length of time, with its attendant brooding on compensation, a most unhealthy frame of mind is fostered.

Moreover, when the case comes up for final assessment and the minimal grant is allotted, what advantage has the workman derived ? He would have been infinitely better off had he not been preoccupied with the idea of compensation. He would have long since been earning his full wages, and morally as well as physically been the gainer.

In the opinion of all those who study the question from a practical point of view and seek the *permanent* welfare rather than the temporary interests of the workman the *disadvantages of awarding compensation for minimal incapacities far outweigh the advantages.* As Brissaud illuminingly remarks, the claimant becomes a victim to the Law of Accidents.

Sand, the noted Belgian expert, maintains that the system of compensation for trivial lesions benefits neither of the parties concerned. Turning to French opinion, we find that Imbert, Masini, and others gravely doubt the advisability of indemnifying slight incapacities, and are of opinion that a change in the law in this sense should be effected. Now, by French law minimal lesions entailing a reduction of under 5 per cent. in earning capacity are ineligible for compensation. It would seem reasonable, then, to assume that French experts are dissatisfied with the existing state of French law, and would apparently favour an approach to that in force under the German Imperial Insurance Office—viz. that lesions *entailing a loss of under* 10 *per cent. of industrial capacity* do not call for compensation.

Still, there are not wanting signs that the workman is very jealous of his prerogatives in this respect—viz. that he has a right to compensation if he suffer any reduction in working capacity through " industrial accident," no matter how slight the measure of the reduction. But while we cordially agree that the rights of the workman should be thoroughly protected, yet we firmly believe that compensation for minimal accidents is not in his own highest and best interests, and we feel sure that the best type of workman would favour rather than obstruct an amendment of the law to the effect that *reductions of working capacity of less than* 10 *per cent.* should *not* be indemnified.

As a counterpoise we think that, as before suggested, *total incapacity* should be *more highly compensated,* and this principle extended to grave lesions involving marked depreciation of the earning capacity.

### *Evaluation of Æsthetic Deformities*

As before observed, the Schedule of Specific Injuries affords us little or no help ; it draws no distinction between loss of *vision*

of an eye and loss of the *organ* itself. In face of such glaring lack of discrimination, small wonder that the remaining information afforded us on this point is so vague as to be useless. We refer to the terms "severe facial disfigurement" and "very severe facial disfigurement." While these expressions urgently call for greater definitude, their inclusion, nevertheless, within the schedule renders the all-important point clear—viz. *that æsthetic considerations, when at issue, should enter into our assessment of pensions.*

Naturally, æsthetic factors assume importance largely in the matter of wounds of the *face* with their resultant *cicatrices*, and also *mutilations* in the same region. Inasmuch as in a later chapter we purpose dealing with the more exact evaluation of these facial deformities, we need here only refer to the general principles that should guide us in our attempt at assessment.

*Scars* of the face do not necessarily entail any *diminution of industrial capacity*, and in such case we have to base our assessment on purely *æsthetic* grounds. Herein we think a reasonable distinction may be drawn between the facial deformities due to "industrial accident" and those the outcome of an "accident of war"—viz. that in the latter instance all sentimental considerations should not ruthlessly be cast aside.

The nation owes a moral debt, which it cannot evade, and which should be discharged however heavy the cost thereof. The right to pension is undeniable if the resultant cicatrices involve the *lids with sequential occlusion of the palpebral aperture*; the same, too, when they involve the *nasal orifices*, the *mouth*, with *narrowing* thereof.

This, obviously, because the damage is real, and industrial capacity may be compromised through interference with *respiration* or *alimentation*.

In respect of *mutilations* the basal criterion will be their *extent*, whether limited or otherwise. When of *limited* size the most important are those which involve either the eye, the nose, the mouth, or the teeth. The separate evaluation of these respective mutilations will be dealt with in later sections.

The *more extensive* mutilations may entail absolute incapacity, e.g. the loss of the two eyes; or, without directly involving the capacity for work, they may by their appalling nature interfere with the vital processes of respiration and alimentation. This will be readily seen when we have regard to the frequency with which the *lower jaw* and the *whole of the tongue* have been avulsed, or the not infrequent instance in which the unhappy soldier has been bereft of the *two superior maxillæ and nose.*

In the face of such appalling afflictions the very least we can

do is to allot them the highest indemnity possible—this irrespective of whether their *industrial capacity is or is not impaired* thereby. Still, it must be admitted that from the *æsthetic* point of view these ghastly deformities can by facial *prosthesis* be most strikingly ameliorated. Nor is this all, for in some instances the *function* of mastication may to a large extent be restored. On these grounds, therefore, Continental authorities have felt themselves, in some instances, justified in *reducing the amount of pension granted.*

Reverting to the consideration of the same problem in relation to "industrial accidents," the following question presents itself: In view of the fact that compensation is based in reference to the earning powers, *are æsthetic deformities which do not diminish working capacity eligible for compensation?*

Generally speaking, given no resultant loss in working capacity, a scar or mutilation does not on purely *æsthetic* grounds entitle to *compensation.* On the other hand, when the disfigurement renders it difficult for a man to obtain employment or entails his pursuing a less remunerative form of labour, judges display a natural tendency to take this into consideration.

Thus, some very interesting cases of this nature have come before the French tribunals. A working mason, as the result of an "industrial accident," acquired a facial paralysis so repulsive in its effects as to make him an object of ridicule and disgust; in addition, he suffered loss of sight and hearing on the affected side. The Seine Tribunal held that in fixing the amount of compensation there was no reason to take into account his facial disfigurement; but in order to indemnify him for the loss of sight and hearing they accorded him an annuity corresponding to a reduction in his salary of 75 per cent. The case was referred to the Court of Appeal, and, Thoinot being deputed to examine him, the decision was reversed in accordance with Thoinot's suggestion and the reduction in earning power rated at 90 per cent.

Forgue and Jeanbrau, from whom the above is drawn, relate further instances which justify a brief reference: (1) A shop assistant sustained a burn of the scalp leading to partial baldness in the occipital region, albeit enough to occasion the wearing of a wig. The Seine Tribunal assessed the resultant reduction of working capacity at 6 per cent. (2) A working moulder (*æt.* fifty-one) sustained section of facial nerve in the parotid region. It resulted in facial distortion and staring expression of the left eye, through palsy of the orbicularis muscle. Nevertheless, it in no wise interfered with his capacity for work or for obtaining employment—this by reason of the fact that his occupation was pursued at the back of the shop and accordingly he did not come

in contact with customers. Balthazar, however, held that the victim's *joie de vivre* was to some extent compromised, and accordingly he was granted an annuity corresponding to a reduction of 10 per cent. in earning capacity.

In conclusion, Roehmer gives it as his opinion that in the case of a young woman the loss of teeth, a blemish of the eye, or a scarring of the face should be held as tantamount to *partial incapacity*; although in a manual worker such trivial lesions might be dismissed as being unimportant.

We have interpolated the above instances to show that the tendency even in cases of compensation is to approach the evaluation of such from a more human standpoint—to take into consideration factors which may only indirectly impair the earning capacity.

### Summary

Reflection on the content of this chapter leads us to the following conclusions:

(1) That the Schedule of Specific Injuries calls for revision—in the direction of precision and amplification.

(2) That the *principles* of evaluation are in urgent need of definition.

(3) That assessment on the basis of *loss of function* is more scientific, more equitable, than one founded on *anatomical* loss.

(4) That, taking as our criterion of evaluation loss of function, it would be possible to take into consideration functional *adaptation*. (*Vide* chapter on "Adaptation.")

(5) That assessment on the basis of *loss of function* is more in accordance with the wish of the Pension Authorities—viz. that assessment should be "in proportion to the degree of disablement."

(6) That the basis on which the evaluation of *multiple disabilities* included in the schedule has been determined be defined—this for the guidance of assessors when confronted with multiple disabilities or infirmities not specified therein.

(7) That, inasmuch as it is contended that the colossal number of disabled soldiers prohibits assessment of their individual claims *in light of their previous occupation or earnings*, some effort at *standardization* be instituted—this to the end of obviating too wide a disparity in awards for similar or identical disabilities.

(8) That for this purpose a council of experts be appointed to compile a "Schedule of Disabilities or Infirmities" after the fashion of the "Guide Barème des Invalidités" recently issued by the French Ministry of War.

(9) That in this same the evaluation of the various disabilities

and infirmities be based as far as possible on the decrees of *civil* legislation.

(10) That in view of the wide disparity in awards for identical disabilities—inseparable from assessment in reference to the *previous earning capacity or occupation*—an *average* be computed of the said findings and such taken as a measure of evaluating similar or identical disabilities as occurring in the disabled soldier.

PRESENTED BY THE EDITOR OF B. M. J.

# CHAPTER XII

## ANKYLOSES

### General Considerations

THE immobilization of a joint may be due to changes in the structures of the articulation—viz. *true ankylosis*; or in those surrounding the joint—*false ankylosis*. It may be *complete*—when all motion is lost; or *partial* or *incomplete*—when some portion of the normal arc of mobility is retained.* Ankyloses are also classified according to the nature of the tissue welding together the joint surfaces, whether *bony* or *fibrous* in character. *False or spurious ankylosis* is a term invoked to describe a condition of joint stiffness in which the limitation of mobility is due, not to lesions of the joint surfaces, but to alterations in the *periarticular* structures—viz. cicatrices, capsular retraction, marginal exostoses, tendinous and muscular lesions (myositis ossificans, etc.), fractures, and dislocations.

It will be seen, therefore, that the pathology of ankylosis varies in accordance with the causal morbid process. In general, it represents the end-product—the cicatrix—of an acute or chronic joint inflammation or of a more or less severe trauma. In all instances *true ankylosis* consists in the formation of fibrous tissue connecting the articular surfaces, and which is apt later to undergo bony transformation.

*Differentiation of Bony from Fibrous Ankylosis.*—The problem is often difficult—this despite *anæsthesia* or the disclosures of a *skiagraph*, which, though of course of value, may be misleading.

Skiagraphy alone should not be depended on for an absolute

* *Partial Ankylosis.*—Anatomically speaking, this may be interpreted as involvement of a portion of the articular surfaces, with resultant restriction of mobility. The pathological process may be varied, and either fibrous or bony bridges can be found linking up—for example, the articular surface of the patella to the femoral condylar groove or the articular surface of the head of the radius to the humeral capitellum, etc. These latter are obviously cases for surgical interference, and as far as the functional value of the joint is concerned this may be as much impaired as if total coalescence of the co-opting surfaces had ensued.

diagnosis, and should always be combined with careful local examination with or without anæsthesia.*

*Osseous Ankylosis* is distinguished by the following features: *absolute immobility, lack of pain on attempt at movement,* and *absence of muscular twitching.*

*Fibrous Ankylosis.*—In this variety *more or less mobility is retained,* but *pain ensues on movement,* with spasm of muscles antagonistic to the latter.

In the vast majority of cases, too, other factors also play a part—viz. thickening and retraction of the capsular and ligamentary structures, with shortening of the muscles.

In any given instance one or other of these elements may predominate, and as far as possible we should endeavour to ascertain the exact anatomical cause of the loss or limitation of movement.

It should be recalled, too, that a joint may become stiff through *prolonged immobilization* on account of some injury or disease elsewhere. This, especially if it be retained in a flexed position, as the flexor muscles undergo *adaptive shortening* when their points of attachment are for long approximated. The same thing may also happen in the *muscular atrophy* due to paralysis, in which the *cartilages* and *bones* atrophy at the same time.

The term ankylosis is *not* applicable to the stiffness which tonic spasm and muscular rigidity produce in the early stages of some joint disorders. Such is purely defensive—an effort to avert pain—and disappears under anæsthesia, whereas ankylosis is not affected thereby.

So much by way of prelude regarding the causes and varieties of ankylosis, and we shall now proceed to consider more narrowly the functional consequences thereof, and their bearing on the working capacity.

* As a general rule the existence of bony ankylosis can be affirmed on the basis of a good skiagraph. Nevertheless, it is well always to have the opinion of an expert, inasmuch as certain shadows may give the appearance of fusion of the articular surfaces; this more especially in the case of the knee, in which articulation, if it be radiographed in a position of incomplete extension, the approximation of the bony projections of the articular surfaces may give the impression of *obliteration of the interarticular space.* In lesions of the hip, skiagraphy has often led to an unwarranted diagnosis of unreduced dislocation of this articulation. Duco and Blum cite a case of this nature in which the subject, on the basis of such a diagnostic error, was held to be entitled to a pension (5e Classe)—viz. equivalent to that accorded to total loss of the use of the limb. Expert examination revealed the case to be one of *hystero-traumatism,* with contracture of the periarticular muscles of the hip and those of the lumbar region. Lastly, needless to say, in the vertebral column repeated examination may be necessary to establish the existence of ankylosis of the lateral spinal joints.

## Ankylosis in Relation to Functional Capacity

The specific attribute of all joints is *mobility*, consequently its abolition or limitation in one or more joints predicates a corresponding decrease in the *working efficiency* of the limb. Especially is this the case in the *upper* extremity, the *functional* capacity of which depends upon the ability to perform the most varied movements with swiftness, vigour, and precision.

In attempting to gauge the degree of *functional* disability occasioned by ankylosis it will, we think, be wise to deal first with the general principles on which the assessment must be based. To begin with, the ankylosis may be *absolute* or *relative*—in other words, total or partial—and to the consideration of these various degrees of joint fixation we now proceed.

### *Total Ankylosis*

The functional consequences of total ankylosis with their correlated effect on the working capacity will vary according to :

(1) The identity of the articulation.
(2) The angle of fixation.
(3) The nature of the occupation.
(4) The amenability of the ankylosis to correction.

(1) *The Identity of the Articulation.*—That the *functional* disabilities imposed by ankylosis are less pronounced in some joints than others is obvious on reflection.

Thus *total ankylosis of the shoulder joint* (scapulo-humeral articulation) does not immobilize the arm to the same extent as ankylosis of the *elbow* immobilizes the *forearm*. For in the shoulder joint proper the movement of *abduction* ceases altogether as soon as the arm is raised to a right angle with the trunk. Its further elevation is effected by the *rotation of the scapula* round its own axis through the action of the trapezius and serratus magnus muscles upon the sterno-clavicular and acromio-clavicular joints, which are capable of slight movements.

Even as in this respect the shoulder has advantages over the elbow, so also is the *hip* better situated than the knee. This is obvious when we realize that if the thigh moves on the pelvis, the pelvis also moves on the thigh, and so in this way the associated disabilities are compensated for and more or less masked.

In some cases of *hip disease*—according to its degree—the limb is shortened by flexion and adduction. To bring the foot again to the ground and to restore the natural parallelism of the

limbs the *pelvis is lowered on the affected side.* In the same way to conceal the flexion of the hip, or at least to minimize its inconvenience, *lordosis* or curving forwards of the dorso-lumbar spine ensues.

Such attempts at adaptation are naturally seen at their best in *young subjects.* For in later years the vertebral column becoming less supple is correspondingly less accommodating in this respect. When we attempt, therefore, to estimate the degree of depreciation in working capacity that follows total ankylosis of the shoulder or hip, we should bear in mind these supplementary or compensatory mechanisms.

(2) *The Angle of Fixation.*—A joint may undergo fixation at any point of its normal arc of motion. The angle at which it occurs is, however, of prime importance, as such largely determines the measure of the depreciation in working capacity that the ankylosis has entailed.

For—given irremediable ankylosis—the usefulness of the limb will vary according as to whether fixation has ensued in a *favourable* or *unfavourable* position.

In the *hip*, ankylosis is but too likely to occur in a *position of flexion, adduction,* and *internal rotation.* But the *favourable* position is one of *abduction with the thigh extended and slightly rotated outwards.*

In the *knee*, ankylosis generally ensues in flexion, but the position of election is one of *fixation in extension.*

Similar considerations obtain with regard to the other joints —viz. there is a favourable and unfavourable position in which ankylosis may ensue, and these we shall discuss in detail in subsequent chapters.

(3) *The Nature of the Occupation.*—If our assessment of the degree of depreciation in working capacity that has resulted from ankylosis is to be approximately just, it must take cognizance of the *vocation* of the individual. For, to a man following a certain employment the consequences of fixation of some particular joint may be far more serious than to an individual pursuing a different calling.

Thus *ankylosis in extension of one knee* may not interfere very materially with a man of *sedentary occupation*—viz. one which depends chiefly on the use of the *upper* limbs. It is far otherwise in the case, say, of a mason who has to ascend a ladder. This it is impossible for him to do, hence he has to consider other means of earning a livelihood. It is clear, too, that with the knee fixed in *extension* any occupation necessitating the act of kneeling is impossible, or, for that matter, one involving the use of a foot pedal.

Again, *fixation in extension of the hip joint*, inasmuch as it renders sitting awkward, would inconvenience a man of *sedentary* occupation more than one whose vocation is of an ambulatory character. For with a hip ankylosed in *extension* the subject walks well without a limp.

Total *ankylosis of the shoulder* would be more serious for a day labourer than in the case of a person whose vocation was one especially requiring the use of the lower limbs—viz. those who by one foot work a press or an engine. Similar considerations may be launched in regard to ankylosis of other joints.

Lastly, one has also to take into consideration the personal equation of the individual—viz. as regards his *power of adaptation to altered mechanical conditions*. For individuals vary very widely in this respect. (*Vide* "Adaptation," chap. x.)

(4) *The Amenability of the Ankylosis to Correction.*—A joint ankylosed in a good position is preferable to a *mobile* but *sensitive* or painful joint lacking stability or endurance. Thus, for example, a *knee fixed in extension* ought always to be respected. For all attempts to obtain a mobile and useful joint have hitherto failed, and consequently it is better left alone.

It is otherwise if ankylosis of the knee in a *vicious position* has ensued. Here the great object to be attained is a *straight limb with firm bony ankylosis*. Consequently, if there be no contra-indications, the question of surgical intervention will have to be considered—viz. correction of the deformity by *arthrodesis* or *compensatory osteotomy*. Needless to say before such measures are counselled the case should be studied in all its bearings. Into this question will enter the age of the subject, the nature of the pathological process, the state of the articular surfaces and joint capsule, the condition of the bones entering into the articulation, also that of the related muscles, nerves, and the soft tissues.

Thanks to the labours of our surgical confrères the outlook in cases of *vicious ankylosis* is distinctly brighter. Thus, apart from the operations of excision and erasion in the knee, mobility in the *elbow* joint has been improved by resection of the head of the radius (with or without plastic transplantations of fascia or by more extensive resections of the Ollier type), and flexion deformity of the *wrist* by the removal through a dorsal incision of a portion of the carpus.

In cases of firm ankylosis of the *hip* in a position of adduction and flexion an *osteotomy* is indicated. If the degree of flexion be extreme, the transtrochanteric route is preferable. For if a subtrochanteric osteotomy be performed, it has the disadvantage that the proximal portion of the femur, being strongly flexed

by the attached iliopsoas, projects awkwardly in Scarpa's triangle.

This operation in some instances must be accompanied by *subcutaneous tenotomy of the adductors*, and the limb placed in an abduction splint or abduction plaster cast, in which it remains for some weeks until bony union is effected in this position.

In some cases *both hip joints* are similarly ankylosed and malposed. In this event the dual requirements have been successfully met by performing an osteotomy on the one and a pseudarthrosis or *arthroplasty* on the opposite hip.

In regard to this last procedure or *arthrolysis* devised by Murphy of Chicago, the surgeon aims at securing an imitation of or substitute for the normal joint surfaces by the interposition of pads of fat, fascia, or muscular tissue. It has been utilized in regard to the hip, shoulder, elbow, knee, wrist, as well as the lower jaw, in instances in which one or other of these joints have become ankylosed as a result of infective or septic arthritis.

The operation has been performed in cases of fibrous as well as of osseous ankylosis, and involves exposure of the articular ends and their remodelling or resection. Subsequently there is interposed a pad of fat and fascia or muscular tissue, this intervening cushion being either free or attached to some neighbouring tissue.

According to Sir Robert Jones the results obtained in the case of the *hip*, *elbow*, and *wrist* are most encouraging; but in the case of the knee—owing to its dependence on ligamentary support—the desirability of replacing stable bony ankylosis by one of unreliable character is distinctly doubtful.

Lorenz, discussing *arthrolysis*—the formation of a mobile joint—holds it unjustifiable if only one hip be ankylosed. He deems unilateral arthrolysis permissible in bilateral ankylosis, though not necessary in all cases. In the *upper limb* he advocates arthrolysis only in the case of the *elbow*, as he thinks a flail-elbow preferable to a stiff one.

The indications for operative mobilization of a joint he considers depend primarily upon the nature of the pathological process.

In *tuberculosis* of the *static* joints—when fixed in a good position—he deems attempt at mobilization criminal, because of the liability to recrudescence. This same danger is also pronounced in *osteomyelitic* ankylosis, but less so in *rheumatic* ankylosis, or that ensuing after *metastatic or traumatic suppuration*.

For *successful mobilization* the following factors—youth, good general health, tolerance of pain, and hearty co-operation are essential; these being most often met with in *gonorrhœal* forms.

Last, but not least, it is imperative that the *state of the related muscles* be well ascertained.

For though arthrolysis may procure a *movable* joint, such does not necessarily mean a *stable* joint. Consequently, if it produce one lacking in endurance, sensitive, and liable to become painful, the operation will be a failure.

Before concluding, there is, however, another most interesting aspect of this subject that calls for brief consideration. We allude to the fact that in regard to the above proposed operative procedures our choice thereof, or, rather, the *functional end-results to be attained thereby*, must be viewed in the light of the subject's occupation.

We have often to consider whether a *firmly ankylosed* is preferable to a *mobile* though *somewhat unstable joint*—this in light of the subject's *occupation*. In other words, does his special vocation demand *mobility* rather than *stability* of the articulation ? Thus, as a recent writer in *Recalled to Life* illuminingly observes : " The labourer will probably prefer a strong stiff elbow instead of a weak movable one, while in some trades mobility rather than strength is essential."

Now, if after taking counsel with the subject it be decided that for the purposes of his particular trade or vocation a firmly ankylosed joint be desirable, then the following question arises : If *fixation* is to be sought after, what is the most serviceable *angle* at which it should ensue ? Thus, for example, for ordinary purposes an elbow fixed at or near a right angle will be most satisfactorily situated. But there are exceptions to this rule. Hence arises the necessity for differential treatment of individual cases—a point graphically illustrated by two examples drawn from the writer above quoted. " A soldier who was a milkman, pointed out that with his elbow at a right angle he could not reach the cow's udder, and the elbow was accordingly set at an angle of about 135 degrees. In another pre-war case a patient had his left elbow mauled by a lion, and insisted that it should be stiffened in a position in which he could take up a gun quickly. Lately this officer has sustained a wound in the right arm, and is now considering the question whether he is to have his old stiff elbow operated upon and learn to shoot off his left shoulder, or have something done to the right arm so that he may in any case resume his sport of big-game hunting. This serves to show that the choice of treatment must be determined by many unexpected factors if the patient is to resume his ordinary life or desires a new calling. In any case he must be consulted in the matter."

We have entered at this length into the question of operative intervention, inasmuch as in some cases of ankylosis with de-

formity, it is clearly desirable to *postpone assessment of the industrial incapacity resulting therefrom until operation has not only been undertaken, but its influence on the working efficiency of the limb—qua the particular trade—has been ascertained.* Obviously, if in selecting our operation we have previously envisaged the same in light of the person's occupation, it follows that the *functional end-results* obtained will be correspondingly improved, and *pari passu* our assessment of the resultant functional incapacities of the limb will be correlatively lowered.

### *Partial Ankylosis*

In this variety we are confronted, not with fixation of a joint, but with *limitation of its normal range of mobility.*

In assessing the influence of such restriction on the working capacity the following elements must enter into the evaluation :

(1) The age of the subject.
(2) The arc of movement retained.
(3) The accessory features.
(4) The nature of the occupation.
(5) The amenability to correction.

(1) *The Age of the Subject.*—In the instructions issued to examining surgeons by the United States Bureau of Pensions, the following passage is to be noted: "The results of advancing age should be observed, and its effects upon the disabilities should be excluded by the Board. *Every disability, the result of age alone, should be described.*" The italics in the foregoing quotation are ours, and they deserve emphasis, for it is insufficiently realized that a restricted range of movement is not necessarily of *pathological import*, and still less of *voluntary production.*

*For with the passing years the normal arc of movement of some joints slowly undergoes limitation.* Thus, for example, agricultural labourers, locksmiths, blacksmiths, and other manual workers, when old, are often unable to extend fully their fingers ; or, as Hoffa has pointed out, to compass strong radial flexion of the hand.

(2) *The Arc of Movement Retained.*—We should in any individual case assure ourselves as to the *exact range of voluntary movement achievable.* To take an example, suppose the mobility of the *thumb* to be partially compromised. Now it is clear that if the person is only capable of moving his thumb from a *position of extension to one of semi-flexion*, he is more severely handicapped than if he were able to move it from one of *semi-flexion to complete*

*flexion.* For in the first event it will be impossible for him to grasp any other than voluminous objects, and this somewhat feebly—a disability not obtaining if the arc of retained mobility extend from *semi to complete flexion.*

Again, suppose the condition to be one of partial ankylosis of the *wrist.* In this case it will be more advantageous if the arc of movement retained be one in the direction of *extension.* Thus, given that the hand can only be moved from a position midway between flexion and extension into one of flexion, this arc of movement is less useful than if the hand could be moved dorsalwards—viz. into extension. This because the power of *fist formation* and *tight gripping* of objects is best effected when the wrist joint *can be fully extended.* Similar considerations apply to the various limitations of mobility which may ensue in other joints, but these will be considered later.

(3) *The Accessory Features.*—Every individual case presents its own peculiarities, associated features in the form of unusual painfulness, muscular wasting, tremor, involvement of other joints, and so forth.

In attempting an assessment of the working capacity, these additional factors will, of course, all have to be taken into consideration.

(4) *The Nature of the Occupation.*—According to the vocation the restriction of a particular arc of motion in the range of a joint is more or less unfavourable to performance of the work required.

Thus, for example, suppose that a man, after injury to his shoulder, finds that he cannot raise the limb *beyond* 90 *degrees or the level of the horizontal.* Now inasmuch as most occupations are pursued below the level of the eyes he would not be much hampered if he were a typist, a pianist, or a worker at a desk or bench. On the other hand, his disability would be serious if he were, say, a mason, standing on a ladder passing bricks up to a fellow-worker situated on the higher rung thereof; or a "house painter" engaged in decorating ceilings, or a "luggage porter," etc.

Again, take a case of *limited mobility in the knee.* If flexion only to an *angle of* 120 *degrees* is possible, it would, in a miner, interfere with his working in a crouched position. On the other hand, a clerk would not be much incommoded, his work being manual, and moreover he can stand, walk, or sit without inconvenience.

With the knee allowing only flexion to 120 degrees, climbing stairs or ladders is difficult, and likewise kneeling. Consequently masons, painters, etc., will be more inconvenienced than persons following a sedentary occupation.

(5) *The Amenability to Correction.*—Joints, the seat of fibrous adhesions which limit but do not entirely prevent movement, are apt to remain irritable and painful when the fibrous bands are stretched. In other words, fibrous ankylosis prejudices functional efficiency, the joints readily becoming tired and painful, while open also to the menace of contractures.

Under such circumstances, the subject being prevented from following an active employment, attempts may be made to stretch or rupture the remaining bands and so obtain *increased range of movement.* Such treatment is very suitable to the stiffness following fractures, *joint injuries,* and *non-tuberculous inflammatory processes* in and around the articulation.

*Gradual Extension of the Arc of Mobility.*—The apparatus invented by Dr. Turner of Montreal has opened up a much more promising vista as regards the restoration of mobility in instances of partial ankylosis. The advantages of the appliance are best exemplified in the case of the knee and elbow joints. Indifferently in the knee or the elbow it is possible by means of this appliance to secure an increase in the range of extension or of flexion in accordance with the necessities of the case.

The underlying principle is one of *gradual and continuous pressure exerted upon one or other of the limb segments* related to the affected joint. Thus, for example, let us take the case of a *knee fixed in extension,* and in which we wish to restore the power of flexion. The Turner splint utilizable for this purpose consists of two bars of iron which are applied in the long axes of the thigh and leg respectively. The bars are connected through the medium of an articulated iron junction furnished with a screw capable of adjustment to the desired angle. The long axis of the screw runs parallel to that of the limb, and while its lower end is fixed to the iron coupling, its upper extremity lies free and *within easy reach of the patient's hand.* In short, the screw admits of movement in either direction, and being adjustable by the subject himself we thus secure that gradual and continuous pressure by which the desired increase in the range of mobility is attained.

*Mode of Application of Turner's Splint.*—From Poupart's ligament to the toes the limb is swathed in elastic stockinet or in bandages. To prevent the injurious effects of pressure the bony projections—the tuber ischii, anterior superior iliac spine, head of the fibula, the malleoli, and dorsum of the foot—are then well protected with wool or felt; in addition care should be taken of the external popliteal nerve as it passes round the neck of the fibula. Subsequently a few layers of plaster-of-Paris bandages are wound round the limb, avoiding the inclusion of the knee joint, and then the splint is applied to its outer side. In so doing care should be taken that the articulated iron junction is *directly opposite the line of the knee joint,* and that the screw is in a position such as will allow of the extreme range of flexion being obtained when the limit of its adjustment is reached. To secure the splint in position, plaster-of-Paris bandages are then applied which encircle the appliance and the limb, again avoiding the joint. As to the number of layers, they should be such as to admit of traction being exerted without breaking or giving way of the plaster.

It is highly important that the plaster of Paris should be the best obtainable, be well moulded—especially as regards the tuber ischii and the lower segment of the limb down to the roots of the toes, as these constitute the respective points of maximum pressure: this in order to secure the *immobility of the appliance*—

viz. to obviate its slipping upwards or sliding downwards. Before the plaster has time to set firmly steps should be taken to ensure that the margins of the plaster on each side of the joint will not come in contact during the process of manipulation of the screw. This at the same time ensures the possibility of free flexion of the joint (for this purpose the popliteal space should be wholly visible through the gap).

Lastly, it should be ascertained that the *foot is at right angles* to the leg, and given that at the same time the sole is well protected by a plaster plate, the subject will be enabled to walk a few steps with the splint on.

As to the length of time during which the splint should be worn, this will vary. As a rule three or four weeks will suffice to secure some improvement. Frequently, however, the splint has to be reapplied by reason of the fact that the excursion of the screw has attained its maximum, and also because by that period the plaster no longer holds the bars in rigid grip.

In reapplying the splint the direction of the bars must be altered and the screw adjusted so as to allow of its maximum excursion. In this way, by modification of the angle of reapplication the arc of movement necessary to bring the leg to or beyond an angle of 90 degrees with the thigh can be attained. This desirable end can usually be secured within two to three weeks of this procedure.

If when the plaster is first taken off the subject is found able of himself to move the limb back to its original position, and this painlessly, such indicates that the response to treatment is likely to be satisfactory, and that reapplication of the splint is advisable. On the other hand, if on removal of Turner's splint the limb becomes fixed in its new position, the apparatus should be reapplied and the joint by this means be put into a favourable position of complete extension.

The reasons for its reapplication are:

(1) To procure a greater range of movement in the affected joint.

(2) To overcome the difficulty of moving the joint—a difficulty largely due to the psychic condition, apprehension of pain, etc.

On final removal of the splint mechano-therapy should be undertaken—viz. radiant heat, diathermy, massage, electricity to the flexors of the leg, and gymnasium treatment (cycling, flexion exercises).

The end-results obtained will naturally vary according as to the nature of the articular lesion and the willingness of the subject to co-operate with pluck and persistence. Given such a "will to win" it is astonishing how cases—at the onset sombre in outlook—will improve, and this to a degree exceeding anticipation.

*The Elbow Joint.*—With regard to this articulation several types and modifications of the original pattern of Turner's splint have been invoked. But the general principle underlying all is identical—viz. the application of two bars to the related limb segments (one to the arm and the other to the forearm) with the connecting junction furnished with a screw easily manipulated by the subject.

*Mode of Application.*—This is precisely similar to that practised in the knee. For the upper *point d'appui* we have to rely on the shoulder and axilla, the lower being afforded by the palm of the hand as far as the distal end of the metacarpus. As in the lower extremity, all bony projections should be adequately protected, and for facility of inspection, and to secure amplitude in the range of mobility, the region of the elbow must be sufficiently exposed by the gap in the plaster.

As to the indications for usage of the splint, these are more difficult of enunciation in the elbow than in the knee. This primarily because in the elbow the movements of flexion and extension are supplemented by those of pronation and

supination through the medium of the *superior radio-ulnar joint.* A simple lesion of the latter articulation does not call for the use of the splint, but one involving the *trochlear elements* (with or without involvement of the superior radio-ulnar joint) is precisely the case in which the utmost benefit can be obtained by this method of treatment. Accordingly, if the superior radio-ulnar joint is involved, it should be corrected and the forearm brought into a position of supination before the application of the splint.

These considerations are applicable both to *intra-* and *peri-articular fibrous lesions* as well as to immobility when due to more remote conditions.

In those instances in which bony bridges exist with resultant osseous ankylosis the only way by which to obtain satisfactory results, especially in the elbow, is by direct surgical intervention.

In the elbow when some degree of movement (flexion or extension) is obtainable, the indications for the usage of Turner's splint vary widely. The best results are to be obtained when the restriction of mobility takes place in the neighbourhood of an angle of 45 degrees, or one of about 150 degrees, as in this instance the splint may be invoked in order to increase the range of mobility as near as possible to a right angle.

For, given restriction of mobility in an elbow joint, its usefulness will vary *according to the arc of mobility retained.* Thus it is clearly more advantageous to be able to achieve a few degrees of motion in the neighbourhood of a right angle than even a greater amplitude at the extreme limit of flexion or extension.

To sum up, the knee and the elbow are the joints most likely to benefit by this method of treatment, inasmuch as the related limb segments in both instances are of approximately equal length. A similar apparatus, however, could be devised to suit other joints, but at present the ends to be obtained are secured by means of passive movements—viz. mechano-therapy and the exercise of handicrafts.

In conclusion, the details of actual *operative* procedures which may have to be invoked according to the needs of individual cases have been omitted, as they do not fall within the scope of this volume, and for their elucidation the reader must familiarize himself with the literature pertaining to such, and which of recent years has been so greatly enriched.

*Other Aspects of Partial Ankylosis.*—The retention of a limited degree of mobility may—in the joints of the lower extremity—not be an unmixed blessing. This certainly if the *related muscles through atrophy* have become inadequate. For in this event, e.g. the knee, the muscles may be unable to support the weight of the body. This being so, the knee is apt to give—with consequent increased liability to falls and sprains. We see, therefore, that *incomplete* or *partial* is not always preferable to *total* or *complete* ankylosis—above all when the latter has ensued in a good position.

As before stated, joints, the seat of fibrous ankylosis, are often painful, irritable, and open to contracture, and hence the subjects have to resort to an apparatus. To obviate such necessity the operation of *arthrodesis*, which has for its end the induction of *bony ankylosis in a good position, has been designed.*

*Indications for Arthrodesis.*—The operation may be invoked for a *flail* or *flexed knee,* and in the *ankle* in the sub-astragaloid joints to fix a flail foot.

In *paralysed joints* Lorenz gives the following indications for arthrodesis. In the *hip* he advocates it only in *bilateral* paralysis, and then only on the more severely affected side. He holds the same view in regard to the *knee,* and considers that in both instances the operation should be deferred till adult life. He does not countenance its performance in the *ankle,* in which joint he thinks the functional stability is diminished even when the operation is in itself successful. In the *shoulder* he deems it justifiable, though counselling its postponement till adolescence. He disapproves of it in the *elbow,* where a simple brace—allowing of nothing but the extended and flexed positions of the joint—gives, he deems, a more useful arm than a stiff elbow in rectangular flexion. In the *wrist,* in cases in which the extensors of the fingers are involved and contracture of the joint in palmar flexion is present, *arthrodesis* is of great value. This not only to correct deformity, but also to reap the advantage of tendon transplantation.

So much for the various means and ways whereby the drawbacks attaching to limited mobility in joints may be counteracted. For it is clearly the duty of the assessor to weigh the possibilities of successful surgical intervention. There is, moreover, much to be said in favour of the *postponing of evaluation* till the *functional* results of such procedures can be gauged.

## CHAPTER XIII

# ANKYLOSES : LIMITATION OF MOVEMENT

## UPPER LIMB

### Ankylosis of Shoulder Joint

THE shoulder is one of the most perfect, beautiful, and at the same time the most mobile of joints. Its excursions, like those of the other joints of the upper limb, play a large part in giving expression to the feelings and emotions of the mind. How eloquent are the movements of the shoulder may be gleaned from the following glowing passage quoted from Sir Henry Morris :

> We see force and emphasis added to the speech of the orator and to the representations of passions by the actor or actress by these movements. It is not easy to specialize in any decided manner, but it may be stated, with some approach to the truth, that the portrayal of feelings of a widely impressed kind, whether it be of despair, resignation, admiration, entreaty, or love, is assisted by movements which occur at the shoulder, often in combination with those effected at the wrist.
>
> So, again, in the more concentrated and decisive states of mind, as when we give a command or a dismissal or definite instructions with dignity or firmness, the shoulder movements are employed with others of the wrist and index finger, the elbow all the time remaining rigid or moving but slightly.

#### FACTORS IN EVALUATION

*Is the Mobility of the Scapula retained ?*—While great freedom of movement resides in the shoulder (scapulo-humeral articulation), it is liberally supplemented by the *free play of the scapula*—notably in *abduction* and *elevation*. How great is the additional mobility thus conferred can be gathered from Golebiewski's affirmation. This noted expert states that in certain subjects the *arc of mobility in the shoulder joint itself does not exceed* 75 *degrees*, and that beyond this point the scapula participates, especially in raising the arm to a vertical position. Therefore *total ankylosis of the scapulo-humeral articulation does not necessarily immobilize the arm*—an all-essential fact for the expert to recollect in assessing industrial capacity.

*The Angle of Fixation.*—This may be said to be *unfavourable* when :

(1) The arm is closely *adducted* to the side of the thorax ; or

(2) If the shoulder joint is fixed *at right angles to the side* in adults.

In the latter instance the subject will be unable to adduct the arm to the side.

On the other hand, the angle of fixation will be *favourable* if the arm be slightly *abducted.* Sir Robert Jones, discussing favourable and unfavourable positions for ankyloses, makes the following observations regarding the shoulder. The most advantageous position is with the arm *abducted to about* 50 *degrees* ; he continues : " The elbow should be slightly in front of the coronal plane, so that when it is at right angles and the forearm supinated the palm of the hand is towards the face."

In support of the foregoing he adduces the following reasons : " With correct position of the arm by flexion of the elbow the hand can be brought easily to the mouth. With fixation of the humerus to the scapula at 50 degrees, elevation of the arm can take place through the scapula, brushing of the hair, reaching of pockets, and picking up a plate or cup without spilling the contents can be attained." Cook, in his recent Hunterian Lecture on Joint Diseases, holds that in the shoulder the position of election for ankylosis is one of *abduction to* 50 *degrees, with slight flexion and internal rotation of arm.*

*Assessment*

*Absolute Ankylosis* is rare, and usually results from *non-traumatic* lesions—viz. tuberculous, gonococcal, or other infections. If due to *trauma* it is usually a sequel of *intra-* or *juxta-articular fractures* or an *unreduced dislocation.*

However produced, the usefulness of the limb is of course greatly impaired, and this especially *if the movements of the scapula are simultaneously lost.* In this event, even though all the remaining joints of the limb be uninvolved, the working capacity of the arm *falls to a quarter, or even less, of the normal.* In the German Annuity Scale the usefulness in the case of the *right* arm is held depreciated by 60 and in the *left* by 50 per cent., estimates which could scarcely be deemed excessive.

We would therefore suggest that some distinction should be drawn in *total ankylosis of the scapulo-humeral joint* between cases in which :

(1) *The movements of the scapula are retained* ; and

(2) *Those in which they are abolished.*

In the first instance we would suggest as a *maximum incapacity*

50–60 *per cent.*, raising this in cases in which the scapula is also immobilized up to 65 per cent. or more.

A further differentiation is also indicated according to the *angle of fixation.* If the shoulder joint be fixed in *slight abduction* to about 50 degrees, and the *mobility of the scapula is unimpaired*, then in the absence of other complications the disability may be rated at from 25–30 per cent. If, on the other hand, the *scapula be immobilized*, then a higher assessment up to 50–60 per cent. is indicated.

If, however, the shoulder joint be immobilized *in adduction or at right angles* to the trunk, and *the scapula be simultaneously immobilized*, then the incapacity should be rated at 65 per cent. or even higher. Should, however, the *movements of the scapula be retained*, the assessment should be correspondingly lowered down to 50 per cent. or even lower.

*Continental Estimates in Total Ankyloses*

| | Per cent. |
|---|---|
| German Jurisprudence ("Le Jurisclasseur") | up to 75 |
| Austrian Imperial Office | 30–35 |
| Ollive and Le Meignen—maximum incapacity | 50–60 |
| Brouardel | 25–65 |
| Roehmer | 50 |
| Remy (Right arm | 30–40 |
| Remy (Left arm | 24–32 |
| Greer | 50–60 |

On analysis we see that the estimates of the incapacity entailed range from 24 to as high as 75 per cent. Inasmuch as no more details are vouchsafed, it will, we think, be justifiable to refer the discrepancies to the peculiar features presented by individual examples. For we have to reckon with the fact that much depends on the presence of complicating features, viz. *atrophy to the muscles, injury to the circumflex nerve*, or *chronic arthritis*—all factors which must enter into the appraisement.

Greer, recognizing this fact, observes that "ankylosis may be estimated according to degree at from 50–60 per cent.; atrophy of muscles, 28–58 per cent.; chronic arthritis, 16–66 per cent." Imbert, discussing all the foregoing Continental estimates, justifies their disparity on the ground that the greater part of the indemnity allotted usually relates to *accessory features*—persistent neuralgias, muscular atrophy, etc. He suggests that given very pronounced cases of ankylosis of the shoulder—this without complication—the resultant depreciation in working capacity as a mean average may be rated at from 45–50 per cent.

## Partial Ankylosis

If fixation of the shoulder is rare, *limitation of mobility* is common. Now *mobility in* the shoulder joint is the salient feature—little or no restraint being exercised by the ligaments, but only by the *muscles*. In accordance with this, any restriction of the mobility of the shoulder is usually the result of adhesions or retraction of the periarticular tissues. French authorities recognize a condition known as *Périarthrite* scapulo-humérale, and under this somewhat comprehensive phrase they group the *end-results* of a variety of *traumatic* lesions—viz. fractures not necessarily involving the articulation, or simple luxations without fracture. A similar *periarthritis*—with resultant incapacity of varying degree—may follow avulsion of the tuberosities, rupture of the tendon of the supraspinatus muscle, and more rarely luxations or fractures of the clavicle, or fractures of the neck of the scapula. But while the supervention of a periarthritis in sequence to such lesions is easily accounted for, we have to recognize what is too often overlooked—viz. that such a periarthritis may follow *simple contusions or sprains of the shoulder*.

The majority of such in our experience exert their effect through the *medium of a subacromial bursitis*, or a *subacute arthritis of the shoulder joint*. But while it is of the utmost importance in any case of injury to the shoulder to establish the exact nature of the lesions sustained, it is somewhat alien to the subject under discussion, which rather concerns itself with the assessment of the *degree of impairment in functional efficiency that has resulted*.

### Factors in Evaluation

Before we draw any conclusions as to the degree of limitation, we should *fix the shoulder blade*, as any restriction may be largely masked *by rotation of the scapula*. If we neglect this safeguard we may readily be led astray as to the range of movement present in the joint itself.

In stiff and painful shoulders the range of movement that can be compassed by *passive exercise* far exceeds that possible by the subject himself. In other words, if the arm is left in complete passivity to the physician, the latter may often raise it *more or less to the horizontal*.

On the other hand, if the subject is asked himself to execute the movement, he often fails to attain to more than 45 degrees. If we can dispose of any attempt at *simulation*, this and not the range attained by *passive* movement is the measure of the true restriction of mobility in this particular direction—viz. *abduction*

*and elevation.* In other words, the range of abduction in the shoulder joint is the degree thereof that can be *voluntarily achieved without displacement of the scapula.* While the foregoing movement is without doubt the most important, it is of course necessary that the powers of *rotation* be also ascertained. In the inward direction it is rarely compromised to any degree, but *external rotation* is often either lost or greatly restricted.

*Muscular Atrophy.*—Always in appraising the effects of injury we should note the presence or absence of *wasting*, for in the *shoulder*, as in the *knee*, very slight injuries may determine marked atrophy of the related muscles. The degree of wasting is often difficult to ascertain, especially in plump subjects, and we have, of course, always to face the possibility that the subject is exaggerating the degree of his weakness.

*Age.*—Suppose that we are confronted with an elderly man who after injury complains of limitation of movement. We should in such a case always examine the *sound or uninjured arm*, as given equal limitation therein, it may be taken that the restriction is not the result of injury, but a *natural concomitant of age.* A healthy young man, it is true, may be able to abduct and elevate his arm till the limb stands parallel to the head and forms a straight line with the trunk. But it will be unreasonable to expect that an old workman should retain this degree of lateral elevation—viz. 180 degrees; as a matter of fact they can rarely achieve elevation beyond 150 degrees, and more often less.

*Prognosis.*—This must also be taken into consideration. The majority of *stiff* and *painful* shoulders tend to improve with time, above all if the subject resumes his work. Still, it does take time, and the prognosis therefore should be guarded, and we should not, in fixing the indemnity, lay too much stress on the probable amelioration of a condition the recovery of which is but too often incomplete. On the other hand, we should not forget that early movement is in the best interest of the subject. Consequently it is well to err on the safe side and accord a less generous indemnity in the hope of securing an earlier return to *work*, and therewith more rapid convalescence.

### *Assessment*

Accepting as the extreme range of mobility an arc of 180 degrees, if a man falls short of this only by 5–10 degrees, it may be regarded as almost negligible. In other words, it *entails no permanent disability other than can be compensated for by use.* There is, therefore, no call for permanent, but merely a *temporary*

award, one such as will cover the time necessary for readaptation to work under the slightly altered mechanical conditions.

Suppose that the resulting limitation is more marked—viz. that the *arm cannot be elevated beyond the level of the horizontal.* Here it must be recalled that as a general rule most manual work is performed at a level below that of the eyes. Therefore, if a man can raise his arm to the level of 90 degrees, and the limb is not handicapped by any other functional defect, he is obviously capable within this range of all grasping movements. Under these circumstances, we would for ourselves regard the arm as retaining *from two-thirds to four-fifths of its functional efficiency.*

According to the German Annuity Scale, the serviceableness of the limb in such cases is held in the *right* arm to be diminished by 25, in the *left* by 22 per cent.

Imbert, discussing limitation of movement after *periarthritis,* rates it as a maximum at 25–30 per cent., and in " Le Jurisclasseur des Accidents du Travail " the decisions of the French Tribunals are summarized as follows: periarthritis, 27–33 per cent.; luxations with persistent stiffness, 3–8 per cent.; limitation of movements, 20–25 per cent. Lastly, Greer points out that the movements of the shoulder may be interfered with or rendered painful in sequence to *fracture of the scapula.* Accepting the Continental basis, in which 100 is reckoned as the maximum of depreciation, he estimates the resulting incapacity at from 10–20 per cent. (*vide* " Paralysis of Circumflex Nerve ").

## Ankylosis of the Elbow Joint

The elbow is a true hinge joint, and as such admits only of flexion and extension, which are limited in extent respectively by contact of the coronoid and olecranon processes of the ulna with their corresponding fossæ in the humerus. The limit of *extension* is not reached until *the ulna is nearly in a straight line with the humerus,* and that of *flexion* not until the forearm makes with the humerus an angle " *varying between something less than* 30 *degrees, and something over* 40 *degrees* "—in other words, between 25 and 45 degrees. In addition to this, however, we have to note that beyond flexion and extension, *pronation* and *supination* are possible through the medium of the superior radio-ulnar joint. Owing to the fact that flexion and extension take place in the *humero-ulno-radial* joint, and pronation and supination in the *radio-ulnar* articulation, it so happens that very exceptionally as the result of disease or injury the power of flexion and extension may be lost, while that of pronation and supination is retained.

So much for the movements of the elbow joint, but any

attempt to gauge the loss incurred through ankylosis thereof by the subject would be incomplete if it failed to recognize the *rôle played by movements of the elbow in expressing the passions and feelings.* Sir Henry Morris on this point remarks :

> In this relation it will be found, I think, as a general rule that *flexion and extension at the elbow* generally indicate feelings of a quick, passionate, and decided character, and are not employed, like the various movements of the shoulder, to suggest or emphasize any transcendent, deep, or tender feelings. The movements of the elbow for the purposes of expression are often associated with the *flexion or closure of the fingers,* whereas those of the shoulder are most frequently employed with wrist movements and, sometimes together with those of the wrist, with others of the index finger also.
>
> Thus, in resolutely striking with the closed fist upon the table ; in hastily brushing away a tear which is unacceptably stealing upon the cheek ; in tearing at the hair in rage ; in attitudes of mental agony, such as that assumed by the actor when as Othello he says, with linked fingers and uplifted hands :
>
> " Not a jot, not a jot ! Blood, Iago, blood !
> But oh, the pity of it, Iago !—the pity of it ; "
>
> and in such-like moods, the elbow and the fingers work together.

## Factors in Evaluation

*The Angle of Fixation.*—It is clear that if ankylosis of the elbow joint in full *extension* or at an *obtuse angle* follow injury the person is severely handicapped. Thus eating is rendered impossible, as the elbow being rigidly extended, the hand cannot be brought to the mouth. Indeed, given *symmetrical ankylosis* in extension of the elbow, the condition of the victim is in truth deplorable.

For the same reason manual work is rendered more difficult in that the subject—unable to bend his elbow—has to work, so to speak, at a distance, and guidance by the eye is necessarily more difficult.

If ankylosis takes place in the *rectangular* position with the forearm supinated, its range of usefulness is much less restricted. Thiem, discussing such cases, considers that when fixed in the *extended* position the resulting depreciation is *from two-thirds to three-fourths of the normal* ; whereas fixation in the *rectangular* position entails the *loss of only two-fifths in efficiency.*

Immobilization at an *acute* angle, viz. 30 degrees—though less disabling than ankylosis in extension—still constitutes a sufficient handicap. For if on the one hand the mechanism of feeding can be achieved owing to retention of pronation and supination, still these latter movements—so essential for the handling of tools—are perforce rendered extremely difficult.

To sum up, the most favourable position is that of flexion at

a *right angle*, or *between this and an acute angle*. This by reason of the fact that in the elbow the measure of any resulting inefficiency through ankylosis must be gauged by *its effects on the hand movements*. Now in the foregoing instance—viz. with the elbow fixed at or near a right angle—the hand retains most of its important functions.

In Sir Robert Jones's opinion an *unfavourable* position for ankylosis of the elbow would be fixation at 130 degrees. The position of *election* he considers is at an *angle of* 70 *degrees*. *In ankylosis of both elbows*, fixation of one at an *angle of* 70 *degrees*, and the other at an *angle of* 110 *degrees*, offers most advantages. At an angle of 70 degrees the patient can button his clothes, brush his hair, reach over a table, and feed himself.

Cook, in his recent Hunterian Lectures, observes: "Inevitable ankylosis is met by securing the joint at an angle of 100 degrees or otherwise *as the patient's occupation indicates*." In short, the angle may be as low as 70 degrees or just over a right angle—as determined by the position in which the subject can best utilize the limb in his particular occupation.

### *Assessment*

Our estimate of the depreciation that has resulted through ankylosis of the elbow joint will vary with the angle of fixation.

For *ankylosis in full extension or at obtuse angle* such will necessarily be high, ranging from 60–75 per cent. But in all such cases the possibility of *correction of the faulty position* has to be considered. Therefore, given no contraindications, the chances of amelioration should be explained to the subject. Then, if after operation sound ankylosis ensue in a favourable position, the usefulness of the limb will be correspondingly enhanced, and our estimate of the depreciation in working capacity lowered accordingly, i.e. down to 25–30 per cent. or less.

## Continental Estimates

(1) *Ankylosis in Full Extension or at an Obtuse Angle*

| | Right Per cent. | Left Per cent. |
|---|---|---|
| German | 40–60 | 30–50 |
| Golebiewsky | 60 | 50 |
| Brouardel | 10–45 | 5–40 |
| Remy | 56 | 45 |
| Imbert | 55–60 | 45–50 |

We may add that the "Wiener Schema" estimates range from 40–50 per cent., those of French Jurisprudence from 35–65 per

cent., while the Austrian Imperial Office is content to allot 25–30 per cent. as a maximum. It will be seen that all these various estimates are fairly harmonious, with the exception of the Austrian Imperial Office.

(2) *Ankylosis at a Right Angle*

| | Per cent. |
|---|---|
| Austrian Imperial Office | 15–20 |
| Wiener Schema | 25–33 |
| Remy | 15–19 |
| Greer | 33–40 |

(3) *Ankylosis at an Acute Angle*

| | | Per cent. |
|---|---|---|
| Austrian Imperial Office | | 20–25 |
| Wiener Schema | | 33–41 |
| Remy | Right | 25 |
| | Left | 20 |

To resume, apart from the movements of *flexion* and *extension at the humero-radio-ulnar* portion of the elbow joint, we have to consider those which occur in the *superior and inferior radio-ulnar* articulations.

## Ankylosis in Pronation and Supination

In the *superior radio-ulnar articulation* the radius rotates around its own axis within the collar formed by the lesser sigmoid cavity of the ulna and orbicular ligament. In the *lower radio-ulnar joint* the radius revolves upon the rounded end of the ulnar. By this rotation the movements of pronation and supination are possible, and in their performance the radius carries with it the hand—communicating to the latter the movements commonly ascribed to the wrist.

Thus, in *pronation* the hand is carried over so far as to face backwards, as in holding the hand to receive anything from behind; or downwards, as in the act of writing or playing the piano; whereas in *supination* the hand is facing forwards, as in throwing an underhand ball at the wicket, or upwards, as in tossing a coin within the hand.

The *range of rotation* amounts only to 135 degrees, but it is further supplemented by *rotation of the humerus inwards and outwards respectively.*

*The power of supination* in man is greater than that of pronation, owing to the immense leverage and great power obtained by the attachment of the biceps to the radial tubercle and inward concavity of the radius. For this reason the tools of workmen are so made that screw-driving, gimlet-turning, and other

mechanical work of this kind, are done by supination of the right hand.

The movements of pronation and supination too play some part in the portrayal of certain feelings, thus, as Sir Henry Morris observes:

> The movement of supination is one indicative of disgust, impotence, and annoyance, as when the palms are quickly turned forwards or upwards as if to say, "We will have none of it," or "I wash my hands of the whole affair."
>
> That of pronation is suggestive both of power and determination, as well as of repose and resignation, as when striking the table with the open palm and letting the forearm drop helpless by one's side. Complete pronation is a position of the greatest elegance and grace, and is one most agreeable to the eye as well as to the feelings.

He continues, "Tennyson knew this when he described Vivien" (trying to arouse the impassioned Merlin) thus:

> Curved an arm about his neck,
> Clung like a snake; and letting her left hand
> Droop from his mighty shoulder, as a leaf,
> Made with her right a comb of pearl to part
> The lists of such a beard as youth gone out
> Had left in ashes.

## Factors in Evaluation

The most *favourable* position in which fixation of the radio-ulnar joints may ensue is with the *radius fixed midway between pronation and supination.* In this, the site of election for ankylosis of these joints, the hand is most useful for dressing, eating, and manual labour. Still, opinions differ as to the most advantageous position in which to ensure ankylosis of these joints. Thus Sir Robert Jones advocates the mid-position between pronation and supination, but others hold that the forearm should be fixed in *full supination.* In truth, the deciding factor is the *subject's occupation.* Thus, if the movements incidental to this can be best achieved with the forearm in full supination, then such fixation should be held to override the necessity for providing for feeding, dressing, etc. This for the obvious reason that the opposite hand can be educated to subserve these requirements.

*Fixation in Supination.*—This diminishes markedly the usefulness of the hand in that it hampers adaptation of its palmar surface in grasping an object. Moreover, any limitation thereof embarrasses correspondingly those screwing and rotary movements so essential in all technical work. Fixation of the hand in *full supination with total loss of the power of pronation* is extremely rare. It is met with after fractures with *fusion of the bones* in a *supine* position or in cases of *total ankylosis of the elbow* and

*wrist* joints. The restriction or loss of the power of pronation in such cases is dwarfed in importance in view of the more serious disability occasioned by the associated joint lesions.*

### *Assessment*

Imbert, in instances in which the right hand is *immobilized in supination*, gauges the incapacity in the right at 55, in the left arm at 45 per cent.

Fixation of the hand in *pronation with its correlated loss of supination* diminishes the power of the hand by about 30–40 per cent.

The following estimates of the resulting incapacity have been suggested :

| | Right | Left |
|---|---|---|
| | Per cent. | Per cent. |
| German Imperial Assurance . . . . . | $33\frac{1}{2}$ .. | 26–30 |
| Imbert . . . . . | 40 .. | 25 |

On the other hand, *simple diminution of the power of pronation* is relatively of trivial import, and by German authorities is regarded as only assessed at 10 per cent.

## Limitation of Mobility in Elbow Joint

Limitation of the range of mobility in the elbow joint may be due to *osseous* deformities—viz. callus which may limit the extent of flexion. But in the majority of instances such restriction is due to alteration in the *soft parts*. When the obstacle is *bony*, all hope of spontaneous amelioration must necessarily be abandoned. But not when the obstruction is due to adhesion or retraction of the soft tissues, in which response to rational treatment is possible. Albeit one must recollect that even in some cases of *intra-articular bony formation* good results have followed the plastic operations already referred to in our introductory remarks.

### Factors in Evaluation

Evaluation of the incapacity produced by limitation of movement in the elbow joint will vary according to the *arc of*

* Fixation of the bones of the forearm in a supine position may ensue in—(1) bony transformation of the interosseous membrane, viz. in bad compound fractures with or without comminution; or (2) in cases of total ankylosis of superior radio-ulnar joint; and (3) in a few cases of ankylosis of the inferior radio-ulnar joint; or (4) in those exceptional cases in which ankylosis supervenes in both upper and lower radio-ulnar joints.

*movement retained.* As before stated, the limit of *extension* is not reached until the ulna is nearly in a straight line with the humerus —viz. 180 degrees; that of *flexion* not until the forearm makes with the humerus an angle of about 30 degrees. We see, therefore, that the total range of these movements is about 150 degrees. As for the movements of pronation and supination, these are possible through an arc of 180 degrees.

Remy rightly divides such cases into three categories:

(1) Those in which the elbow admits of *flexion to an angle between* 75–105 *degrees*—viz. about a right angle—and such are *the most favourable cases.*

(2) Cases in which flexion to its maximum, 30 degrees, is possible, but in which extension to a right angle is impossible and falls short of 75 degrees.

(3) Instances in which extension is satisfactory while flexion to a right angle is impossible, and cases in this category he regards as most *unfavourable.*

*Assessment*

Remy suggests the following:

| | Right<br>Per cent. | Left<br>Per cent. |
|---|---|---|
| Movement possible between 75°–105° . . | 15 .. | 12 |
| „ „ „ 30°–75° . . . | 30 .. | 24 |
| „ „ „ 105°–180° . . | 50 .. | 40 |

## Relaxation of Elbow Joint

When *preternatural mobility* or a flail-like condition of the elbow joint exists, it may for purposes of assessment be adjudged as one ankylosed in the *extended* position. Imbert rates the resulting incapacity as 60 per cent. (right), 50 per cent. (left). In this matter of a flail-elbow, the subject's *occupation* is a deciding factor. While for a workman the above estimates would be appropriate, it is not so with a highly skilled artist or even a clerk. For in both instances a flail-joint with a bracelet supporting it is more useful than an elbow joint ankylosed in extension. Consequently the assessment should be rather less in their instance, say 50 per cent. for the right and 40 per cent. for the left.

## Ankylosis of Wrist Joint

The wrist joint is capable of the following movements: flexion, extension, abduction, and adduction—and a combination

or quick sequence of these—viz. circumduction. Those of flexion and extension have a range of from 95–130 degrees—extension being normally freer than flexion. Adduction in its range exceeds that of abduction, the former attaining to 50 degrees, the latter only to 32 degrees (Golebiewsky).

*Pronation* and *supination* take place, *not at the wrist*, but at the radio-ulnar joints. But though these movements do not take place at the wrist they are the most useful as far as the functions of the hand are concerned.

### Factors in Evaluation

All decisions as to the measure of the incapacity entailed by ankylosis of the wrist are based on the degree to which the *functions of the hand* are compromised thereby.

*Ankylosis in flexion* is the most *unfavourable* position.

*Fixation in extension* or *dorsi-flexion* is the most *favourable.* Thus *any limitation in extension or dorsal flexion* of this joint is immediately reflected in the *incompleteness or diminished strength* with *which fist formation or hand closure can be accomplished.*

Marked limitation of extension—through its weakening of the hand-grip—is of serious import. But slight restriction thereof—if the power of closing the fist be retained—may be dismissed as unimportant.

The opposite extreme—*fixation of the wrist in flexion*—is most crippling. It weakens the power of the hand-grip, disturbs the balance of power between the flexors and extensors, and lessens the capacity for co-ordinating the movements of the fingers.

### *Assessment*

From the foregoing remarks it will be seen that the degree of incapacity entailed through ankylosis varies with the angle of fixation. In our opinion *ankylosis in flexion* should be assessed at from 40–45 per cent.; while *fixation in full extension*—the most favourable position—may be rated at 10–20 per cent.

### *Continental Estimates*

| | *Day Labourers* | | *Workers in Arts* | |
|---|---|---|---|---|
| | Right | Left | Right | Left |
| | Per cent. | Per cent. | Per cent. | Per cent. |
| Total ankylosis (Brouardel) . | 20–35 | 5–15 | 30–45 | 20–30 |
| „ „ (Greer) . . | 25–33 | | — | — |
| „ „ (Wiener Schema) | 25–33 | | — | — |

In appraising the degree of incapacity occasioned by *restricted mobility of the wrist*, the higher estimates are obviously called for in *limitation of extension*. In marked restriction thereof Thiem estimates the incapacity in the right at 23–25 per cent., in the left at 20 per cent.

## The Hand

Sir Charles Bell, in his classic treatise, observes: "We ought to define the hand as belonging exclusively to Man, corresponding in its sensibility and motion to the endowments of his mind, and especially to that ingenuity which, through means of it, converts the being who is the weakest in natural defence to be the ruler over animate and inanimate nature."

We see, therefore, that the *functional capabilities of the arm* must be judged in light of this salient consideration, that *all the joints thereof, from the shoulder downwards, are subservient to the uses and functions of the hand.*

The strength and freedom of motion of the ball-and-socket joint of the shoulder, the security of the hinge of the elbow, the pronation and supination between the bones of the forearm, the strength and gliding movement of the wrist, are all provisions for the easy, rapid, varied, and powerful actions of the hand.

In other words, *grasping* is the *specific function of the upper limb*, and all the joint movements thereof are subordinate to this end. So it is that with every movement of shoulder or elbow there automatically ensues an involuntary innervation of the prehensile apparatus—viz. the *wrist flies into extension*—that position in which the hand is most favourably placed for the exercise of its special function—grasping. To this end *extension* in *the wrist joint* is freer than flexion, but so beautifully adapted are the various parts of the hand that the more limited range of flexion at the *wrist joint* is compensated for by the greater freedom of flexion than of extension permissible at the *medio-carpal* joint.

Indeed, as Sir Henry Morris has pointed out, the range of both flexion and extension at the medio-carpal articulation is much more extensive than in the wrist joint. So it is that the *hand* enjoys a greater range in these respects than is permitted at the wrist joint alone. More than this, so extensive is the range of flexion permitted at the medio-carpal and the carpo-metacarpal articulations, that on the whole the degree of *flexion of the hand* is greater than that of *extension*.

## Functional Importance of the Thumb

No description of the hand, however concise, must fail to take cognizance of this fact. Albinus, if we recall rightly,

characterizes the thumb as the lesser hand, the assistant of the greater—"manus parva, majori adjutrix"; and says l'Apertigny: "L'animal supérieur est dans la main; l'homme le pouce."

This is easily understood when we recall that *in the foot all the toes are nearly parallel to the mid-line thereof, while in the hand only the four inner digits are—the thumb forming an angle with the mid-line of the hand of rather more than* 45 *degrees.* When the hand is fully extended the angle which the thumb makes with the vertical line through the mid finger is between 50 and 55 degrees. To this *divergence of the thumb* is due its facility of opposition to each and all the fingers; hence the importance of its *carpo-metacarpal joint.* Now the chief feature which distinguishes the latter from the other carpo-metacarpal articulations —from which it is quite detached—is its mobility. Thus the thumb can be brought into contact with each finger singly or with the tips of all collectively. It can be made to touch any part of the palmar or radial surfaces of any of the fingers separately, and can be brought down firmly upon the dorsal aspect of the first, second, or third when flexed as in the formation of the fist. The power of opposing the thumb to any of the fingers is due to the forward and inward obliquity of its movement of flexion, which is by far the most extensive movement of the thumb. The movement of adduction is limited on account of the proximity of the second metacarpal bone; that of abduction is very free. The movement of the trapezium upon the rest of the carpus somewhat increases the range of all the movements of the thumb.

## The Working Functions of the Hand

The superiority of the human hand depends upon the length, strength, free lateral motion, and perfect mobility of the *thumb.* The *length* of the thumb distinguishes man from the quadrumana, while its strength—equivalent to that of all the fingers—is all-essential to the hand's perfection. For without the fleshy ball of the thumb the power of the fingers would avail nothing, and the bulging thenar eminence is the distinguishing feature of the human hand, especially that of an expert workman. Again, the difference in the length of the fingers, as Sir Charles Bell observes,

> serves a thousand ends, adapting the form of the hand and fingers for different purposes, as for holding a rod, a switch, a sword, a hammer, a pen or pencil, engraving tool, etc., in all which a secure hold and freedom of motion are admirably combined.

When analysed, the chief functions of the hand, as Remy has pointed out, resolve themselves into three main categories.

(1) *Prehension or Grasping of the Whole Hand*

By this is understood the massive grip of an object whose contour the fingers encircle while the security of the hold is cemented by the close application of the thumb to the fingers. In this way is formed what Remy has termed "l'anneau pollici-digital"; in other words, the ring formed by *opposition of the thumb and finger or fingers.* A hand retaining this power intact is capable of grasping either large or small objects. But injured workmen often complain that though they can easily hold a *bulky* object, they experience difficulty in seizing a *small* article. Obviously the thumb is indispensable to this manœuvre, as indeed for most functions of the hand. All the same the energy of the grip is so much the less when any of the other digits are stiff, or when one or more have perchance been lost.

(2) *Digital Prehension*

By this is understood the act of seizing an article between the thumb and the index finger, or between the thumb and one or more digits, as in writing, designing, drawing, etc.

(3) *Digito-Palmar Prehension*

This particular mode of grasping is necessary for the manipulation of certain tools, viz. those furnished with a spherical top, such as a gimlet, bradawl, etc.

## The Thumb: Ankylosis and Limitation of Mobility

Though the thumb possesses only two phalanges its mobility largely depends on the integrity of the articulation between the *trapezium* and *first metacarpal bone.* For the gliding of the trapezium upon the rest of the carpus somewhat increases the range of all the movements of the thumb—particularly that of *opposition.* Lastly, it must be borne in mind that not only may ankylosis ensue in the *carpo-metacarpal,* but also in the *metacarpo-phalangeal* and *interphalangeal* joints, and this either separately or simultaneously.

In addition one should recollect that lesions involving the tendons—especially the flexors—may lead to impairment of movement, the resulting disability being equivalent to that produced by articular lesions.

### Factors in Evaluation

The movement of opposition, as before pointed out, takes place in the *carpo-metacarpal articulation.* If through injury ankylosis ensue in this articulation, the subject will be *unable to close the fist* as formerly. This because for energetic fist formation the thumb must be forcibly applied to the incurved fingers. Not only this, but the whole palm is also pressed forward against the fingers, this taking place chiefly through *opposition of the ball of the thumb,* viz. the metacarpal bone clothed with muscles. It is on this account that a significant degree of mobility is inherent in the first metacarpal. Now in fist formation the *index* and *middle* fingers are driven into the palm towards a point corresponding to the origin of the adductor pollicis. But in normal workers' hands the power of flexing the *terminal* joints of these fingers is frequently limited, and this by reason of the hard indurated skin which prevents extensive excursions in these end joints. As a consequence, in fist formation the index and middle fingers are almost invariably pressed, not into the palm, but into the *ball of the thumb.* Naturally, when thus handicapped, *adduction and opposition of the first metacarpal bone* are all the more essential for powerful clenching of the fist. If it does not occur, the tips of the index and middle fingers in a worker's hand fail to approximate to the palm by a distance varying from a half to two centimetres.

We see, therefore, that the incapacity entailed by ankylosis of the carpo-metacarpal joint will vary according to the measure of its effect upon the *power of fist formation.* This, again, will vary according to the *angle of fixation.* For ankylosis of this articulation may take place in flexion or extension. Of the two, *flexion* is clearly the more favourable, especially if of moderate degree.

#### *Assessment*

*For ankylosis of the carpo-metacarpal joint in extension* we would estimate the depreciation in capacity in the right hand at 33–35 per cent., in the left at 25–30 per cent. *In ankylosis of the same in flexion* we would rate it in the right at from 20–25 per cent., and in the left at 15–20 per cent.

Clearly the degree of the incapacity entailed will vary in different individuals, and this *according to the nature of their occupation.* Thus, while for *day labourers* the above estimates may be apposite, or for those whose occupation depends mainly on the use of the *lower limbs*; on the other hand, for *workers in*

*the arts* it should be elevated in the right to from 40–55 per cent., and in the left hand to from 25–40 per cent.

*Ankylosis of the Proximal Phalanx of the Thumb.*—If the joint be rigid in the *extended* position it offers practically little or no hindrance to the effective closure of the fist. If ankylosed in the *flexed* position it represents an obstacle to fist closure which tends to become greater as time goes on, and this consideration should enter into our assessment of the disability occasioned.

*Ankylosis of the Terminal Phalanx of the Thumb.*—For persons engaged in coarse manual labour there would seem to be no reason for other than minimal compensation such as 10 per cent.

## Limitation of the Mobility of the Thumb

The incapacity entailed will vary with the *arc of movement retained.* Thus, if the thumb is only capable of being moved from a position of extension to one of semi-flexion, it is more disadvantageous than if from *semi-flexion to complete flexion.*

For in the first instance it would be impossible for the subject to grasp other than voluminous objects, and this somewhat feebly. In other words, under these conditions the object has to be adapted to the finger rather than the finger to the object—a disability not met with in the second variety.

### *Assessment*

Remy, discussing the more *unfavourable arc of mobility* (from extension to semi-flexion), rates the incapacity in the right hand at 7·5, in the left at 6 per cent. Whereas, when movement from semi-flexion to complete flexion is possible he assesses it at 3·7 in the right, and in the left at 1·8 per cent.

*Section of the Extensor Tendon.*—This occasions difficulty in movement of the thumb, viz. results in the loss of the power of voluntary extension—a venial disability as compared with the loss of flexor capacity. This accounts for the fact that the German authorities admit no indemnity for this lesion, though the French Tribunals have granted awards varying from 7–10 per cent.

*Section of the Flexor Tendons.*—This is a much more serious lesion because the *power of opposition to the fingers is abolished.* The utility of the hand in this instance falls at least to one-sixth of the normal, and in the right hand the incapacity entailed should be rated at 15 per cent., and in the left slightly lower.

## The Fingers

As for the movements executed by the fingers, the chief are *flexion* and *extension*. The latter is rarely involved directly, but *indirectly to facilitate flexion*—to place the hand in a position favourable for grasping an object. It must be recalled, too, that the fingers can be approximated to or separated from each other, but these are much less important than the movements of flexion and extension.

### Factors in Evaluation

For the hand, properly speaking, there is *no favourable position in which ankylosis may ensue*. Thus, *fingers* immobilized in extension are practically useless. Such fixation and extension may follow tendinous or nervous lesions and, more important still, may be the outcome of badly fitting splints, or may even arise spontaneously when the fingers are left to themselves and not properly supervised. Whatever the ætiology, from a practical point of view, it must be recollected that when the *metacarpo-phalangeal* joints have for some time been fixed either in *full* or *hyper extension*, the recovery of mobility is both tedious and difficult. Moreover, they are a constant source of trouble through their liability to injury, which renders their loss in many ways preferable. Little more use can be claimed for fingers when immobilized in *flexion*. Though in this instance, it is true, they may serve a passive rôle if curved round the tool in hook-like fashion ; or if the handle thereof can be inserted and held in the hollow of the palm. Still, in effect, the loss of mobility renders the fingers almost useless, for be it noted that ankylosis of a finger hampers equally both flexion and extension. However, when a *single* finger is immobilized it is far better that it should be fixed in *extension* than in *flexion*. In the latter instance it greatly hinders the functioning of the neighbouring digits in the seizure of objects.

Again, there are cases in which a *stiff impotent* finger—particularly the middle digit—may cause no little trouble, and the question of amputation through the middle of the proximal phalanx or through the metacarpo-phalangeal joint comes up for decision.

Lastly, a word may be said as to that troublesome condition of semi-dislocation *backwards* or towards the dorsum of the *proximal* phalanges which sometimes ensues, and in which the restoration of mobility is often a very difficult problem.

## Limitation of Mobility in Fingers

In the fingers, as in the thumb, all depends on the *arc of movement retained*. The *favourable* cases are those in which the

range is from *semi-flexion to complete flexion* (as in Dupuytren's contracture); the *unfavourable*, from *extension to semi-flexion*. That this is so is clear, inasmuch as in the latter instance, digital prehension being impossible, the hand is therefore useless for the purpose of grasping tools, etc.

*Assessment*

For the purpose of estimating the degree of incapacity entailed through ankylosis or limitation of mobility in the joints of the digits, we would refer the reader to the appended list of tables, in which the estimates vouchsafed by Continental authorities and others are arranged.

## PERIODS OF ADAPTATION AS DETERMINED BY THE GERMAN IMPERIAL INSURANCE OFFICE

### Ankyloses of the Upper Limb

*Shoulder Joint.*—Whether situate in the right or left upper limb, *partial limitation of the arc of mobility* in this joint has been followed by *adaptation* after periods ranging from one to three years with resultant diminution or abolition of annuity. Thus an example is cited of a factory worker who, in sequence to an injury of his right shoulder, suffered restriction of its arc of mobility by one-fourth. Adaptation thereto was secured after the lapse of *one and a half years*. It is clear, however, that our knowledge of the periods of time required for adaptation in severe war injuries of the shoulder stands in sore need of amplification. But generally speaking, for slight degrees of limitation of mobility the foregoing period of *one to three* years will probably in the main be found correct.

*Elbow Joint.*—Slight *flexor* limitation in the *right* elbow, so the above authorities maintain, impairs but to a minimal degree the industrial capacity of the victim—the same after a period of *three* years being compensated for by adaptation. The annuities in several instances of this nature have accordingly therefore been lowered.

In estimating the supervention of adaptation to restricted mobility of the *right* elbow they lay great stress on mensuration. Thus in regard to a particular instance, they remark that the circumference of the *right* is 1 centimetre more than that of the left arm. This, they maintain, shows that the limb has been used after a normal fashion in work, and that therefore it is legitimate to assume that *adaptation* to the disability has been attained.

In regard to limitation in mobility of the *left* elbow but little exact information is furnished. The authorities do, however, state that in *complete* ankylosis of the left elbow at 150 degrees reduction of the annuity by 10 to 15 per cent. at the end of some years is—by reason of adaptation—permissible.

*Wrist Joint.*—Limitation in *flexion* of the *right* wrist, though it may entail a certain inconvenience in the use of the hand, yet according to the German authorities it is not proved that the same involves any diminution in industrial capacity—any inferiority in the labour market.

As regards the periods required for adaptation to more severe functional disabilities we may cite the following: A female agriculturist, in sequence to accident, suffered diminution in flexion and extension of the wrist to one-third of the normal. Adaptation thereto was accomplished after five years. A labourer sustained a fracture of the forearm with resultant slight limitation of the range of pronation and supination in the wrist. Adaptation was attained after eight years.

Inasmuch as partial ankyloses of the wrist arise most frequently in association with *fractures* of the lower end of the forearm we have postponed further discussion of adaptation in this connexion to a subsequent chapter dealing with fractures.

## Ankylosis of the Right Hand

The German Imperial Assurance Authorities have evidently devoted a great amount of laborious research as to the periods required for adaptation to the varying degrees of disability imposed by ankyloses, single, or combined of the basal, mid, and terminal joints of the thumb and digits of the right and left hand respectively.

*Thumb*

| Ankyloses. | Period of adaptation. | | |
|---|---|---|---|
| | Extension. | Hyper-extension. | Flexion. |
| *Ungual phalanx* . . . . | 2½–2¾ years | 3¼ years | 1½ years |
| Ungual phalanx in extension, with partial ankylosis of basal joint and trophic troubles . . | 8–9 „ | — | — |
| Ungual phalanx in extension, with adherent scar . . . . | 10 „ | — | — |
| *Basal joint* in extension . . | 8 „ | — | — |
| *Limitation of mobility* of ungual phalanx, with reduction of sensitiveness and thickening of phalanx . . . . . | 3½ „ | — | — |

*Index Finger*

In ankylosis in *flexion* of this finger, in which the tip of the digit failed of approximation to the palm by distances ranging from $\frac{4}{5}$–$1\frac{3}{5}$ inch, adaptation was declared as accomplished after periods ranging from $4\frac{1}{3}$–$11\frac{1}{2}$ years.

On the contrary, in an instance in which *extension* of the index was to some extent restricted—though *flexion* was feasible—adaptation was more tardy of realization—viz. it was only admitted to after the lapse of 14 years.

Youth in all instances favours *adaptation*, and in the eyes of the German Imperial Assurance Authorities ankylosis of the *index* finger does not in the youthful constitute anything more than an inconvenience, and does not predicate *limitation* of *industrial capacity*.

*Middle Finger*

Ankylosis in *extension* of the mid and terminal phalangeal joints, with *retention of mobility* in the *metacarpo-phalangeal articulation*, does not prejudice industrial capacity after the initial inconvenience has been surmounted. Here it may be observed that abolition of the power of extension in the mid-phalangeal joint is compensated for by *hyperextension* of the *basal* articulation.

In regard to the actual periods required for *adaptation* to the disabilities imposed by ankyloses of the joints of this digit, the following facts have been ascertained: In ankylosis in *flexion* the periods range from $2\frac{1}{4}$–$20\frac{1}{2}$ years; in those fixed in *extension* 6–14 years; and when at a *right angle* 12 years.

*Ring Finger*

In instances of ankylosis in *flexion* adaptation is realized after periods ranging from 1–2 years. It may be recalled that ankylosis in acute *flexion* of the mid-phalangeal joint of the ring finger is compensated for by *hyperextension* of the *basal* articulation thereof.

*Little Finger*

The periods required for adaptation in ankylosis ensuing in the position of *flexion* range from $1\frac{1}{2}$–$6\frac{1}{2}$ years, but the same in *extensor* ankylosis is extended to 6 years.

**Ankylosis of Several Digits**

In a case of slight limitation of the movements of *flexion* of the fourth and fifth digits, *adaptation* was only acquired after

12 years. In another instance, an agricultural labourer, 7½ years had to elapse before he adapted himself to the disabilities imposed by ankylosis at a *right angle* of the fourth and fifth digits (the *basal* joints being mobile). In yet another example of ankylosis of the fourth and fifth digits in slight *flexion*—with correlated wasting of the forearm muscles—13 years elapsed before adaptation ensued.

## Ankyloses of Left Hand

The following observations will, we venture to hope, prove helpful in adumbrating the probable duration of the functional disabilities accruing through ankylosis of the joints of the left thumb and digits:

### *Thumb*

In ankylosis of the *ungual phalanx in flexion* no less than 15 years was required for adaptation, but when fixed in extension a shorter time—10 to 11 years.

These contrast markedly with ankylosis of the *basal joint in flexion*, in which case adaptation was attained after 3½ years. In an instance in which the two proximal joints of the thumb were fixed in *extension*, 6 years elapsed before adaptation was admitted.

### *Index Finger*

| Articulation involved. | Angle of fixation. | Period of adaptation. |
|---|---|---|
| Mid-phalangeal | Flexion | 7–11 years |
| | Extension | 16 „ |
| Basal | Flexion | 14 „ |
| | Extension | 9 „ |
| Terminal and mid-phalangeal | Flexion | 4½ „ |
| | Extension | 5–9 „ |
| Terminal and mid-phalangeal (demi-flexion) | Flexion | 11 „ |
| | Extension | 4½ „ |

### *Middle, Ring, and Little Fingers*

In the *middle digits* the periods of adaptation range from 8–15 years according to the *degree of ankylosis* and the number of *joints affected*; in the *ring* finger, from 5–14; and in the *little* finger, from 2–9 years.

# TABLES OF EVALUATION IN ANKYLOSES OF THE UPPER LIMB

## A. ANKYLOSIS OF THE SHOULDER

| Lesions. | German Law (Le Jurisclasseur). | French Law (Le Jurisclasseur). | Remy. | | Ollive and Le Meignen. | Austrian Law. | Rohmer. | Brouardel. | | Imbert. | | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Up to % | % | Right % | Left. % | % | % | % | Right. % | Left. % | Right. % | Left. % | Right. % | Left. % | Right. % | Left. % |
| Complete ankylosis accompanied by fixation of scapula. | 75 | — | 30–40 | 24–32 | 50–60 | 30–35 | 50 | 25–65 | 10–55 | 50 | 45 | 50<br>With *fixation* of scapula and without complications. | 40 | 30<br>In simple uncomplicated cases of ankylosis of shoulder in abduction at 50°. | 25 |
| | | | | | | | | | | | | 60<br>With painful periarthritis and fixation of scapula. | 50 | 60<br>In above cases with in addition fixation of scapula. | 50 |
| Scapulo-humeral periarthritis. | 20–25 | 27–33 | In cases with favourable mobility between the vertical and horizontal plane forwards, 13–16 %. In unfavourable mobility, 24–30 %. | | — | — | — | — | — | 10–25<br>In exceptional cases up to 30 %. | 5–15 | 40<br>With mobility of scapula. | 30 | 50<br>In simple uncomplicated cases of ankylosis of shoulder in adduction or at right angles to trunk. | 40 |
| Limitation of movements. | | 20–25 | | | | | | | | | | 10–20<br>In cases of *limitation of mobility*—arc of mobility ranging between vertical and anterior horizontal plane. | 10 | 70<br>In above cases with in addition fixation of scapula. | 60 |
| | | | | | | | | | | | | 30–35<br>*Unfavourable* arc of mobility; other angles. | 20 | | |

## B. ANKYLOSIS OF THE ELBOW

| Position of joint. | Wiener Schema. | French Law. | German Law. | | Austrian Imperial Office. | Golebiewsky. | | Brouardel. | | Remy. | | Imbert. | | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Right. | Left. | | Right. | Left. | Right. | Left. | Right. | Left. | Right. | Left. | Right. | Left. | Right. | Left. |
| | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| At an obtuse angle or in extension. | 40–50 | 35–65 | 40–60 | 30–50 | 25–30 | 60 | 50 | 10–45 | 5–40 | 56 | 45 | 55–60 | 45–50 | 60 | 50 | 75 | 60 |
| At a right angle. | 25–33 | — | — | — | 15–20 | 40 | 30 | — | — | 19 | 15 | 25 | 20 | 30 | 20 | 30 | 25 |
| At an acute angle. | 33–41 | — | — | — | 20–25 | — | — | — | — | 25 | 20 | 30 | 25 | 40 | 30 | 40 | 30 |
| | | | | | | | | | | | | Extreme flexion, 60 % | | Extreme flexion, 60 \| 50 | | | |

## C. LIMITATION OF MOBILITY OF THE ELBOW

| Range of mobility. | Remy. | | Duchaffour. | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|
| | Right. % | Left. % | | Right. % | Left. % | Right. % | Left. % |
| Between 75° and 105° | 15 | 12 | His estimates vary without details between 4 % and 35 %. | 10 | 10 | 16 | 12 |
| Between 30° and 75° | 30 | 24 | | 20 | 15 | 33 | 25 |
| Between 105° and 180° | 50 | 40 | | 50 | 40 | 50 | 40 |

## D. FLAIL-LIKE CONDITION OF ELBOW JOINT

| Wiener Schema. | Imbert. | | Suggested. | |
|---|---|---|---|---|
| | Right. % | Left. % | Right % | Left. % |
| % 50–75 | 60 | 50 | 60 | 50 |

## E. ANKYLOSIS OF THE RADIO-ULNAR JOINTS

| | Remy. | Imbert. | | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|
| | % | Right. % | Left. % | Right. % | Left. % | Right. % | Left. % |
| Fixed in supination. | 56 | 55 | 45 | 50 | 40 | 50 | 40 |
| Fixed in pronation. | 30 | 40 | 25 | 40 | 30 | 35 | 20 |

## F. LIMITATION OF THE MOVEMENTS OF PRONATION AND SUPINATION

| Wiener Schema. | Remy | French Law. | French Guide Barème. | | | Suggested. |
|---|---|---|---|---|---|---|
| | | | | Right. % | Left. % | |
| % 16–41 | Limitation of supination, 15–30 %. Limitation of pronation, 10 %. | Limitation of supination, 30 % (according to Seine Tribunal). | Limitation of supination. Limitation of pronation. | 20–30 10 | 10–20 5 | Limitation of supination, 25 %. Limitation of pronation, 10 %. |

## G. ANKYLOSIS OF THE WRIST

| French Law. | German Law. | Wiener Schema. | Austrian Statistics. | Brouardel. | Ollive and Le Meignen. | Remy. | Imbert. | French Guide Barème. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|
| % 20–60 | % 40 | % 25–33 | % 15–20 | % 5–45 | % 15–20 | In extension: Right, 9 %. Left, 2·5 %. In flexion: Right, 37·5 %. Left, 30 %. | Average. Right. % 25 \| Left. % 20 Minimum, 5–10 %. Maximum, 35–40 %. | In extension: Right, 20 %. Left, 10 %. In flexion: Right, 40 %. Left, 30 %. In pronation: Right, 40 %. Left, 30 %. In supination: Right, 50 %. Left, 40 %. | In extension: Right, 20 %. Left, 10 %. In flexion: Right, 45 %. Left, 40 %. |

## H. LIMITATION OF MOBILITY OF THE WRIST

| French Law. | Brouardel. | Remy. | Imbert. | French Guide Barème. | Suggested. |
|---|---|---|---|---|---|
| 2·5–20 %. | 0–30 %, according to the trade. | If extension impossible: Right, 15–30 %. Left, 12–24 %. | — | Equal movements on each side of vertical: Right, 8 %. Left, 5 %. Extension impossible: Right, 15–20 %. Left, 10–20 %. Favourable arc of mobility in pronation: Right, 10 %. Left, 8 %. Unfavourable arc of mobility in supination: Right, 20–30 %. Left, 10–20 %. | If extension impossible: Right, 25 %. Left, 15 %. |

## A. ANKYLOSES OF THE JOINTS OF THE THUMB

| Articulation. | French Law. | | German Law. | Wiener Schema. | Austrian Statistics. | | Remy. | | Imbert. | | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Right. % | Left. % | % | % | Right. % | Left. % | Right. % | Left. % | Right. % | Left. % | Right. % | Left. % | Right. % | Left. % |
| Interphalangeal. | 1·5–13 | 3–10 | 10 | 8 | 0–83 | — | 2 | 1·6 | 10 | 8 | 7 | 5 | 8 | 6 |
| Metacarpo-phalangeal. | 8–10 %. | | — | 16–20 | in 112 cases. | 0–50 in 102 cases. | Ankylosis at a right angle (?), 4 %. Ankylosis in extension, 7·5 %. | Ankylosis at a right angle (?), 3·2 %. Ankylosis in extension, 6 %. | 15 | 10 | 10 | 8 | Flexion, 12 %. Extension, 8 %. | Flexion, 10 %. Extension, 6 %. |
| Carpo-metacarpal. | — | | 15 | — | — | — | 20 | 16 | 20 | 16 | 20 | 15 | Flexion, 20–25%. Extension, 33–35%. | Flexion, 15–20%. Extension, 25–30%. |
| Interphalangeal and metacarpo-phalangeal joints combined. | 13–14 | 9–12 | 10–25 | 25–33 | — | — | 15 | 12 | 25 | 20 | 20 | 15 | 20 | 15 |

## B. LIMITATION OF MOBILITY OF JOINTS OF THE THUMB

| Lesion. | French Law. | | German Law. | Wiener Schema. | Austrian Statistics. | Remy. | | Imbert. | | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Right. % | Left. % | | | | Right. | Left. | Right. % | Left. % | Right. % | Left. % | Right. % | Left. % |
| In interphalangeal or metacarpo-phalangeal joint. | 6–10 | 2–10 | Nil for slight limitation of mobility. | — | — | Arc of mobility from semi to full flexion, 3·7 %. Arc of mobility from extension to semi-flexion, 7·5 %. | Arc of mobility from semi to full flexion, 1·8 %. Arc of mobility from extension to semi-flexion, 6 %. | — | — | 5–10 | 2–10 | 6 | 4·5 |
| Limitation of mobility due to division of extensor tendon. | 7–10 | | — | — | — | — | — | 5 | 4 | 8 | 5 | 6 | 4·5 |
| Limitation of mobility due to division of flexor tendon | — | | — | — | — | — | — | — | — | 10 | 8 | 15 | 10 |

## A. ANKYLOSIS OF THE JOINTS OF THE INDEX FINGER

| Articulation. | French Law. | German Law. | Wiener Schema. | Austrian Statistics. | | Remy. | | Imbert. | | Le Jurisclasseur des Acc. du Travail. | | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Right. | Left. | Right. | Left. | Right. | Left. | Right. | Left. | Right. | Left. | Right. | Left |
| | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| Distal-phalangeal. | 2–5 | — | 0–8 | — | — | 2 | 1·6 | 3 | 2 | — | — | 5 | 2 | Nil. | Nil. |
| Mid-phalangeal. | 1–9 | 10 | 8 | — | — | 3 | 2·5 | 10 | 7 | — | — | 10 | 7 | 8 | 5 |
| Metacarpo-phalangeal. | — | — | 8–16 | 0–50 in 119 cases. | 0–33 in 140 cases. | 7·5 | 6 | 12 | 9 | — | — | 8 | 6 | 10 | 8 |
| | Right. % | Left. % | | | | | | | | | | | | | |
| Distal- and mid-phalangeal combined. | 4–15 | 4–10 | — | 8–16 | — | — | 12 | 10 | 15 | 12 | — | — | 15 | 10 | 12 | 10 |
| All three joints. | — | 10–20 | In extension, 16–25 %. In flexion, 0–30 %. | — | — | 15 | 12 | 18 | 14 | 9–17 | 7–15 | 20 | 15 | 16 | 12 |

In the case of the metacarpo-phalangeal joint the estimates are purely theoretical as ankylosis of this joint alone but rarely appears in practice.

B. LIMITATION OF MOBILITY OF THE JOINTS OF THE INDEX FINGER

| Lesion. | French Law. | German Law. | Wiener Schema. | Austrian Statistics. | Remy. | | Imbert. | | Le Jurisclasseur des Acc. du Travail. | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Right. % | | | | Right. | Left. | Right. % | Left. % | % | Right. % | Left. % | Right. % | Left % |
| Simple stiffness of meta-carpo-phalangeal joint. | 5 | — | — | — | From semi to full flexion, 3 %. From semi-flexion to extension, 7·5 %. | From semi to full flexion, 1·5 %. From semi-flexion to extension, 6 %. | — | — | 5 | 5 | 5 | 3–5 | 2–3·5 |
| Other joints. | — | — | — | — | — | — | — | — | — | 5–10 | 0–10 | | |
| Injury of flexor tendon interfering with flexion. | 1–12 | — | — | — | — | — | 10 | 8 | — | 8 | 6 | 8 | 6 |
| Section of extensor tendon. | — | — | — | — | — | — | 4 | 3 | — | 5 | 4 | 4 | 3 |

A. ANKYLOSES OF THE JOINTS OF THE MIDDLE FINGER

| Articulation. | French Law (Le Jurisclasseur). | German Law. | Wiener Schema. | Austrian Statistics. | | Remy. | | Imbert. | | Le Jurisclasseur des Acc. du Travail. | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Right. | Left. | Right. | Left. | Right. | Left. | | Right. | Left. | Right. | Left. |
| | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| Distal-phalangeal. | 1–5 | — | Exceptional cases, 10 %. | — | — | 0·6 | 0·5 | 2 | 1 | — | 3 | 2 | Nil. | Nil. |
| Mid-phalangeal. | 5–6 greatest in flexion. | 10 | 8 | — | — | 1·5 | 1·2 | 4 | 3 | — | 4 | 3 | 3 | 2 |
| Metacarpo-phalangeal. | 7 | — | 8 | 0–50 in 71 cases. | 0–50 in 51 cases. | 2 | 1·5 | 7 | 5 | — | 7 | 5 | 6 | 4 |
| Distal- and mid-phalangeal combined. | — | — | 8 | — | — | 3·5 | 1·6 | 10 | 6 | 3–10 | 10 | 5 | 7·5 | 5 |
| All three joints. | 5–14 | — | In extension, 8–16 %. In flexion, 8–20 %. | — | — | In extension, 5 %. | In extension, 4 %. | 12 | 9 | — | 15 | 10 | 10 | 8 |

B. LIMITATION OF MOBILITY IN JOINTS OF MIDDLE FINGER

| Lesion. | French Law. | | German Law. | Wiener Schema. | Austrian Statistics. | Remy. | | Imbert. | | Le Jurisclasseur des Acc. du Travail. | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Right. % | Left. % | | | | Right. | Left. | Right. % | Left. % | | Right. % | Left. % | Right. % | Left. % |
| Stiffness of the metacarpo - phalangeal joint. | 3–10 | 2–4 | — | — | — | From demi to full flexion, 2 %. From demi-flexion to extension, 2·5 %. | From demi to full flexion, 1 %. From demi-flexion to extension, 2 %. | — | — | — | 3–10 | 2–5 | 3 | 2 |
| Injury of flexor tendon interfering with flexion. | 2·5–6 | | — | — | — | — | — | 8 | 6 | — | 5 | 4 | 6 | 4 |
| Injury of extensor tendon. | 4–10 | | — | — | — | — | — | 2 | 1 | — | 3 | 2 | 2 | 1 |

## A. ANKYLOSES OF THE JOINTS OF THE RING FINGER

| Articulation. | French Law. | German Law. | Wiener Schema. | Austrian Statistics. | | Remy. | | Imbert. | | Le Jurisclasseur des Acc. du Travail. | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Right. | Left. | Right. | Left. | Right. | Left. | | Right. | Left. | Right. | Left. |
| | % | | % | % | % | % | % | % | % | | % | % | % | % |
| Distal-phalangeal. | 2–4 | — | — | — | — | 0·6 | 0·5 | 2 | 1 | — | 2 | 1 | Nil. | Nil. |
| Mid-phalangeal. | — | — | 8 | — | — | 1·5 | 1·2 | 4 | 3 | — | 4 | 3 | 3 | 2 |
| Metacarpo-phalangeal. | — | — | 8 | 0–50 in 16 cases. | 0–66 in 21 cases. | In extension, 2 %. In flexion, 1 %. | In extension, 1·5 %. In flexion, 0·5 %. | 7 | 5 | — | 6 | 4 | 6 | 4 |
| Distal- and mid-phalangeal combined. | — | — | 8 | — | — | 3·5 | 1·6 | 10 | 6 | — | 10 | 5 | 8 | 6 |
| Mid-phalangeal and metacarpo-phalangeal combined. | 2–13 | — | 8–16 | — | — | — | — | — | — | — | — | — | — | — |
| All three joints. | 6–10 | — | In flexion, 0–20 %. In extension, 8–16 %. | — | — | In extension, 5 %. In flexion, 4 %. | In extension, 4 %. In flexion, 3 %. | 12 | 9 | — | 12 | 8 | 10 | 8 |

B. LIMITATION OF MOBILITY OF THE JOINTS OF THE RING FINGER

| Lesion. | French Law. | German Law. | Wiener Schema. | Austrian Statistics. | Remy. | | Imbert. | | Le Jurisclasseur des Acc. du Travail. | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Right. | Left. | Right. | Left. | | Right. | Left. | Right. | Left. |
| | % | | | | | | % | % | | % | % | % | % |
| Stiffness of joint. | 3–8 | — | — | — | Favourable arc of mobility, 2 %. Unfavourable arc of mobility, 2·5 %. | Favourable arc of mobility, 1 %. Unfavourable arc of mobility, 2 %. | — | — | — | 3–10 | 2·5 | 3 | 2 |
| Injury to flexor tendon causing loss of flexion. | 10 | — | — | — | — | — | 8 | 6 | — | 4 | 3 | 6 | 4 |
| Section of extensor tendon. | — | — | — | — | — | — | 2 | 1 | — | 1–2 | 1 | 2 | 1 |

## A. ANKYLOSIS OF THE JOINTS OF THE LITTLE FINGER

| Articulation. | French Law. | German Law. | Wiener Schema. | Austrian Statistics. | | Remy. | | Imbert. | | Le Jurisclasseur des Acc. du Travail. | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Right. | Left. | Right. | Left. | Right. | Left. | | Right. | Left. | Right. | Left. |
| | % | % | % | % | % | % | % | % | % | | % | % | % | % |
| Distal-phalangeal. | No functional importance. | — | No functional importance. | — | — | 0·6 | 0·5 | 2 | 1 | — | 2 | 1 | Nil. | Nil. |
| Mid-phalangeal. | — | — | No indemnity. | — | — | In extension, 2 %. In flexion, 1·5 %. | In extension, 1·6 %. In flexion, 1·2 %. | 2 | 1 | — | 2 | 2 | Nil. | Nil. |
| Metacarpo-phalangeal. | — | — | — | 0–33 in 35 cases. | 0–33 in 39 cases. | In extension, 4 %. In flexion, 1 %. | In extension, 3·2 %. In flexion, 0·5 %. | 5 | 3 | — | 4 | 3 | 4 | 2 |
| Distal- and mid-phalangeal combined. | 2–10 | — | — | — | — | In extension, 7·2 %. In flexion, 3 %. | In extension, 6 %. In flexion, 2·4 %. | 7 | 5 | — | 6 | 5 | 6 | 4 |
| Mid-phalangeal and metacarpo-phalangeal combined. | — | — | 0–8 | — | — | — | — | — | — | — | — | — | — | — |
| All three joints. | 4–7 | 0–10 | 0–10 | — | — | In extension, 10 %. In flexion, 4 %. | In extension, 8 %. In flexion, 3 %. | 10 | 8 | — | 8 | 6 | 8 | 6 |

## B. LIMITATION OF MOBILITY OF THE JOINTS OF THE LITTLE FINGER

| Lesion. | French Law. | German Law. | Wiener Schema. | Austrian Statistics. | Remy. | | Imbert. | | Le Jurisclasseur des Acc. du Travail | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Right. | Left. | Right. | Left. | | Right. | Left. | Right. | Left |
| | % | | | | | | % | % | | % | % | % | % |
| Stiffness of joint. | 2–4 | — | — | — | Favourable arc of mobility, 2 %. Unfavourable arc of mobility, 4 %. | Favourable arc of mobility, 1 %. Unfavourable arc of mobility, 3·2 %. | — | — | — | 2–5 | 2–5 | 3 | 2 |
| Division of flexor tendons. | 8 | — | — | — | — | — | 6 | 4 | — | 4 | 3 | 6 | 4 |
| Section of extensor tendon. | — | — | — | — | — | — | 2 | 1 | — | 1–2 | 1 | 2 | 1 |

## ANKYLOSIS OF ALL THE FINGERS

| French Law. | | German Law. | Wiener Schema. | Austrian Statistics. | Brouardel. | Remy. | Imbert. | | Ollive and Le Meignen. | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Right. | Left. | | | | | | Right. | Left. | | Right. | Left. | Right. | Left. |
| % | % | | % | | | | % | % | | % | % | % | % |
| 50–89 | 44–60 | — | 58–66 | — | — | — | 60 | 55 | — | 60 | 50 | 60 | 55 |
| | | | | | | | | | | Limitation of mobility, 40 | 30 | | |

## CHAPTER XIV

# ANKYLOSES : LIMITATION OF MOVEMENT

## LOWER LIMB

### Ankylosis of Hip Joint

THE hip, like the shoulder, is a ball-and-socket joint, and admits of the following movements—viz. flexion, extension, abduction, adduction, rotation, and circumduction. Of these *flexion* is the most important, the most frequent, and the most extensive movement at the hip joint. The extent to which in some cases it can be carried is seen in the acrobat who, while standing on one leg, can place the other foot behind his neck.

Leaving such feats on one side, it may be said that " in any person of ordinary activity, if the spinal column be fixed and the pelvis steadied, flexion in the abducted and outwardly rotated position can be carried through between 145–150 degrees *when the knee is bent* and a little pressure is exerted by the hand upon it " (Morris). With the knee *extended*, flexion at the hip is checked by the hamstring muscles just short of a right angle—according to Weber, 86 degrees.

All the varied movements possible at the hip joint may undergo limitation either individually or simultaneously. But the *hip*—as regards ankylosis and limitation of mobility—has the advantage over the *knee* just as in these respects the *shoulder* has advantages over the *elbow*.

Thus, when the *knee* is in a *vicious* position, no correction is possible, and the deformity is obvious. But not so in the *hip*, for in its instance there come into play *compensatory mechanisms* —viz. the *mobility of the pelvis and the lumbar spine*—whereby deformities and their associated disabilities are masked, and to a certain extent minimized—a fact to be borne in mind in assessing the depreciation in industrial capacity.

Ankyloses of the hip usually follow fractures of the neck of the femur, luxations of the hip, vicious cicatrices, etc.

### Factors in Evaluation

The criterion here, as in other joints, is the *angle of fixation.*

*Is it Favourable?*—It may be described as such if the limb is fixed in *extension*, with neither flexion, abduction, adduction, nor rotation. Or if the limb is fixed in *slight flexion*, with *no abduction or adduction.*

Fixed in the *extended position* walking is easy, the subject being able to thrust forward his pelvis with each advancing step of the affected limb. Other attitudes, however, are less facile of assumption. Thus, *sitting* in particular is difficult, for the mobility of the vertebral column offers no compensatory mechanism which can take the place of the necessary *right-angled flexion of the hip.* The subject, therefore, can sit only upon one buttock, the rigid thigh projecting straight downwards with the knee thrust back beneath the seat. They are hampered also in the matter of rising from or sinking into a chair, while the assumption of a squatting or bent posture is likewise difficult of achievement.

Clearly, then, ankylosis of the hip in the extended position entails considerable disability. If, unhappily, the ankylosis be *symmetrical*, the subject's condition is much aggravated—indeed to the extent that walking is almost impossible; and according to his occupation the subject may well find himself totally incapacitated.

While *fixation in extension* hampers more particularly the act of *sitting*, on the other hand, *ankylosis in flexion* may interfere with *walking* and *standing*, this, however, if only the flexion is severe, but not, as before postulated, if it be slight in degree. For in the latter instance the compensatory mechanisms above alluded to come into play.

According to Sir Robert Jones, the ideal position for ankylosis of the hip is one of *very slight abduction with the thigh extended, and very slight outward rotation.* For in this position lordosis with its associated lumbar pain is obviated. Again, given slight abduction, freer pelvic movement in walking is secured. Moreover, slight outward rotation does away with the unsightly lifting of the pelvis which otherwise ensues. For owing to the immobility of the hip joint the subject, when walking, rises on his toes. Lastly, with the toes pointing straight forward, walking is rendered more difficult.

*Is it Unfavourable?*—Unfortunately in the hip ankylosis is only too likely to occur in *flexion and adduction with internal rotation.* This position leads to lordosis and lameness. For adduction brings the limb too near the middle line, and so inter-

feres with the position of the sound limb in walking. Moreover, by entailing abduction of the sound limb, the freedom of the gait is still further restricted.

It has been before remarked that ankylosis even in a good position entails sufficient disability, and a fortiori if it has supervened in malposition. The unhappy victim whose *hips are immobilized in a position of marked flexion with adduction* is condemned perforce to bed.

For ankyloses in malposition, whether *symmetrical* or otherwise, the question of evaluation is best postponed *pending the results of surgical intervention.* Thus, in ankylosis of the hip in flexion, or adduction, or flexion with adduction, a *subtrochanteric osteotomy* combined with *subcutaneous tenotomy* of the adductor tendons and fascia is indicated.

In *symmetrical ankylosis with malposition* the dual requirements have beens uccessfully met by performing an *osteotomy* on the one and a pseudarthrosis or *arthroplasty* on the opposite hip. According to Sir Robert Jones the results attained by this procedure are most encouraging.

### *Assessment*

Ankylosis in *slight flexion* may be compensated for, and does not necessarily impair the usefulness of the limb to any appreciable degree. But fixation in *marked flexion*, or in *flexion with strong adduction*, will call for a generous indemnity up to 80–90 per cent. Brouardel's estimates range between 30–80 per cent., while Ollive and Le Meignen do not hesitate to appraise the depreciation at 70–90 per cent., save in persons following a sedentary occupation. The "Wiener Schema" allots 58 per cent. for ankylosis in *extension* and 50–75 per cent. for ankylosis in *flexion.* The most discriminating estimates are those furnished by Imbert. He suggests as an average from 40–50 per cent. *when no compensatory curve has been produced in the vertebral column.* In cases with a *secondary lordosis* the indemnity should, he thinks, be increased to from 60–70 per cent.—*if the compensatory curves suffice to establish the natural parallelism of the lower limbs*—albeit with a certain difference in length. Lastly, if the *compensatory mechanisms are insufficient to correct the deformity*, he considers that the indemnity should be increased up to 80 per cent. or more.

## Limitation of Mobility in Hip

Ollier, quoted by Imbert, is of opinion that *complete ankylosis* in a *favourable* position hampers a person less than *incomplete*

*ankylosis in malposition.* In cases in which the range of mobility retained admits of *flexion* to 45 degrees, Remy allows 15–20 per cent.; but in less favourable instances he proposes 30–35 per cent.—an estimate which Imbert, however, regards as quite inadequate.

## Ankylosis of the Knee Joint

The movements which occur at the knee are flexion and extension, with a slight degree of rotation. *Flexion* is only checked by contact with the soft parts of the ham, while *extension* is checked by the anterior crucial as well as by the lateral and posterior ligaments. *Rotation* is only possible at the extreme limits of flexion and extension. Lastly, the femoro-tibial articulation admits of slight *lateral* movements, easily perceptible during complete passivity of the limb, though impossible in forced extension or flexion.

### Factors in Evaluation

The knee may be said to be ankylosed in a *favourable* position when fixed in *extension.* This position confers solidity on the limb, though a little inconvenient in that the toes are apt to drag along the ground, so that the subject is obliged to raise his pelvis, e.g. when walking, or when separating the affected foot from its fellow. The disability thus incurred may be compensated for in one of two ways: (1) by shortening the limb; (2) by slight flexion which achieves the same result when the limb is not shortened. The *compensatory flexion,* if it is to be effectual, should not exceed 5–15 degrees, if more than this is necessary the position of the limb entails awkwardness.

The ankylosis would be *unfavourable* if the knee were fixed in *hyperextension.* But this is very rare, and much more commonly it is immobilized in *flexion.* It is usually held that *the greater the degree of flexion the greater the disability.* Thus immobilization in acute flexion renders the limb unavailable for support, and therefore absolutely useless.

Still, we venture to assert that herein resides a fallacy. It is not strictly true that the greater the flexion the greater the disability. On the contrary, as Imbert observes, flexion to an acute, and still more to a right, angle is really less disabling than *flexion to an obtuse angle.* For while in the former contingency an artificial support is necessitated, it does supply the one essential need—viz. security of support when standing or walking. On the other hand, flexion to an *obtuse* angle is difficult to correct even with apparatus. For even if the subject can walk on the sole of

his foot, he is still obliged to compensate the flexion at the knee by flexion at the hip. Moreover, this *dual flexion* involves marked shortening, pronounced limping, and a vicious attitude of the trunk.

Sir Robert Jones, discussing the site of election for ankylosis of the knee, advocates the position of *extension* as being the most desirable. Thus he proceeds:

> The knee should be fixed in an extended position. Very good reasons may be given in favour of slight flexion of the knee from the point of view of elegance in repose and that of ease in mounting stairs. Due weight should be given to these arguments, but in the case of war injuries the straight position obviates many risks. Ankylosis, as we know, is not necessarily bony. When it is *fibrous* the tendency is for the flexion angle to increase with exercise. The incidence of the body-weight on a slightly bent knee, unless the ankylosis is sound and bony, will increase the flexion. The position, therefore, is mechanically a weak one for carrying body-weight. Even when new bone is forming its complete consolidation is a slow process, and if the surgeon places such a knee in a slightly flexed position, the degree of ultimate flexion is often greater than he would wish. The advantage of increased strength and stability imposed by an extended joint will generally outweigh all other advantages.

### *Assessment*

*Absolute ankylosis in extension* calls for neither rectification nor surgical intervention. In such a case operative interference is unwise, as in the knee—owing to its dependence on ligamentary support—the desirability of replacing a condition of *stable* bony ankylosis by one of unreliable character is distinctly doubtful.

In instances in which the leg is in *full extension* or nearly so, Remy assesses the depreciation in industrial capacity at only 20 per cent., and Ollive and Le Meignen accept this figure. Other authors, however, and we think rightly, far exceed this limit. For clearly in such a case the nature of the occupation must be taken into consideration. Thus Brouardel, including this essential point in his purview, gives estimates varying from 20–60 per cent.

Doubtless in Brouardel's instance the wider range of figures is referable to the fact that this authority rightly assumes that the *nature of the occupation* in such cases must not be disregarded. For obviously in a *vocation* depending mainly on the use of the *lower* limbs the disability entailed by ankylosis would be proportionately greater than in an employment involving mainly that of the *upper* limbs.

Remy, Ollive and Le Meignen's estimates appear to us too low, and for ankyloses in *extension* we would assess the incapacity at from 25–45 per cent.—the higher figures being reserved for

instances in which the subject earns his living mainly by the use of his *lower limbs.*

For *ankylosis in malposition* Ollive and Le Meignen rate it at 50 per cent. and over, in sharp contrast to the Austrian Imperial Office, which, while it accords 25 per cent. for ankylosis in a good position, only admits 30 per cent. for cases fixed in malposition. The difference in the depreciation of working capacity entailed by favourable as opposed to vicious ankylosis is far more than is represented by 5 per cent.

The noted expert, Golebiewsky, does not hesitate to award 70–80 per cent. when the wearing of an artificial support is necessary. Imbert, however, for his part does not see why an ankylosis of the knee—necessitating an artificial support—should not be placed on the same basis as an amputation of a limb involving the same aid. He suggests 60–65 per cent. as a more reasonable indemnity in such cases. Of course, in all such instances of *vicious* ankylosis the possibility of *operative rectification* must be carefully canvassed, and assessment postponed pending observation of the results obtained from operation when practicable. The above estimates, of course, apply to cases in which the resources of surgery have been exhausted, or to those in which such intervention is contraindicated.

### Limitation of Mobility of Knee Joint

Our assessment of the loss in earning capacity will vary according to the arc of movement retained.

Thus, when the restriction is *minimal,* movement from complete extension (180 degrees) to an angle of 70 degrees posteriorly being possible, the usefulness of the joint may be held as practically unimpaired. If his work necessitates the adoption of a *kneeling* or *crouching* posture, flexion to about 70 degrees is essential.

If flexion to a *right angle* is possible, and the person's occupation does not involve kneeling, he is in no wise incommoded.

If flexion to an *angle of* 120 *degrees* is feasible, the subject can stand, walk, or sit without much inconvenience. He is hampered only in the matter of ascending stairs or ladders, and kneeling is, of course, hindered.

In the case of the knee joint the retention of a certain arc of movement may occasion inconvenience, viz. *if the related muscles are wasted.*

Thus, given atrophy of their substance we have at once this disability, that the knee tends to give under the weight of the body, and thus increases the liability to falls and strains. Under

these conditions clearly a total ankylosis is preferable, especially if in good position.*

*Assessment*

*Stability* as a means of support being in the knee the chief desideratum, we must in these cases of *fibrous* ankylosis always carefully note the *state of the related muscles.* For obviously all the advantages associated with retained mobility will be nullified if the knee tends to give under the weight of the body. Clearly, therefore, given *weakness* or *marked atrophy* a more generous indemnity should be accorded.

Again, as our previous remarks indicate, the subject's *occupation* should be reviewed in relation to the arc of movement retained. Thus, for example, if *flexion* only to an angle of 120 degrees is possible, this in the case of a mason would mean that he could not ascend a ladder. Clearly, therefore, his indemnity should be larger than in a person of sedentary employment.

The German Assurance Authorities, in cases in which flexion only to 120 degrees is possible, assess the depreciation in working capacity at 25–30 per cent. The same authorities, if flexion to a right angle is feasible, and the subject's *occupation* does not necessitate kneeling, rate the disability at 15–20 per cent.

For ourselves, we would suggest that given *efficiency of the related muscles,* the indemnity should roughly be rated according to the arc of movement retained.

Thus, if flexion to an *angle of* 70 *degrees* be possible, the disability should be rated at from 0–15 per cent. If flexion only to *a right angle* is possible, and the person's occupation does not involve kneeling, 15–20 per cent.

If kneeling is essential the assessment should be raised up to 40 per cent. or more.

Of Continental estimates, Remy, in cases in which the arc of mobility retained is favourable, rates the incapacity at 0–15 per

* Sudek has drawn up the following table, which may prove useful in estimating the degrees of disability conferred by the various degrees of limitation in range of movement of the knee:

| | | |
|---|---|---|
| To | 180° | . Standing upright easy. Walking, sitting, mounting, bending, kneeling difficult. |
| From | 130°–140° | . Standing upright and walking easy. Sitting, mounting, bending, kneeling difficult. |
| To | 120° | . Sitting, standing, walking easy. Mounting, bending, kneeling difficult. |
| To | 90° | . Walking, standing upright, sitting, bending, mounting easy. Kneeling difficult. |
| From | 80°–70° | . All attitudes are possible, but the position of kneeling cannot be maintained for long. |

cent., and in instances in which the range of movement is less favourable allots 10–20 per cent. Brouardel's figures oscillate between 10 and 40 per cent., and those of "Le Jurisclasseur des Accidents du Travail" between 15–30 per cent.

Clearly each case must be judged on its own merits, and the foregoing estimates may in some instances have to be considerably elevated—viz. when, owing to *lack of muscular support*, the knee approximates to a *flail-like* condition. Given such instability—if operative interference be contraindicated—the depreciation may be equivalent to that entailed by loss of the limb. Lastly, if stable ankylosis can be produced by operation, the assessment must be altered accordingly.

## Ankylosis and Stiffness of the Foot

Movements of the foot occur, not only in the tibio-tarsal joint, but also in the other articulations thereof, still the various ankyloses lend themselves to simultaneous consideration. In attempting to estimate the degree to which a foot has undergone functional depreciation we should examine carefully the following movements to determine in what respect one or other or all of them are impaired.

*Flexion and Extension.*—The foot forms the inferior segment of the lower limb, and its mean position is at a right angle to the leg at the ankle joint. It is thus horizontal in direction when the body is erect. Both *flexion* and *extension* of the foot have about equal amplitude, equivalent to a range of 40 degrees either way from the right-angle position. Rotation round a vertical axis—viz. *adduction* and *abduction*—is also possible, also rotation round an antero-posterior axis; in other words, *pronation* and *supination.*

The most *favourable* position for ankylosis is *at a right angle*, one in which the foot is perpendicular to the leg, neither deviating to one side nor the other. On the other hand, ankylosis may take place in malposition—viz. with the foot in a *position of flexion or extension.* That of *flexion* is less disabling, since the subject can still walk upon his heel, while if his foot is in *extension* walking is extremely difficult. *Rotation inwards or outwards* is also very tiresome. Thus, when in a position of equino varus the subject walks on the outer border of the foot, while in the inverse case, pes valgus, he walks on the inner border of the foot, and of the two the latter is the more difficult and painful. Apart from this, we have to recollect that, if a foot be ankylosed in a bad position, such reacts unfavourably upon the *knee*, and even the *hip* joint.

*Assessment*

If the foot be ankylosed in a *good* position, Ollive and Le Meignen suggest 15–20 per cent., Golebiewsky admits as a maximum 33 per cent., and the " Wiener Schema " 41 per cent., while German authorities oscillate between 33 and 40 per cent. Brouardel takes as a minimum 10–25 per cent., and as a maximum 40–60 per cent., these last estimates are in Imbert's opinion palpably too high, and Remy's suggested 5 per cent. he regards as too low, and for himself inclines to Ollive and Le Meignen's findings—viz. 15–20 per cent.

As to ankylosis in *malposition*, it presents of course all degrees of severity, and may amount to an extreme disability. In such instances the " Wiener Schema " grants 50 per cent., but it is impossible to strike an average, the types presented being so diverse. Some of these cases find it impossible to walk without crutches, while others with very marked talipes equino-varus may find it very easy to get about.

In short, there is little doubt that in all these unfavourable ankyloses it is a matter more for the surgeon than the judge; in other words, assessment should be postponed until the resources of surgery have been exhausted, when the measure of residual depreciation can be more accurately gauged.

## Articular Stiffness or Limitation in Mobility

Remy distinguished two categories: (1) Joints retaining a *useful range* of mobility, viz. cases in which movements are possible 15 degrees on either side of a right angle—that is, from 75 to 105 degrees—in which event he allots 0–10 per cent. (2) Joints with *limited range*, so limited as to constitute a very decided disability. In such cases according to degree he allots 5–25 per cent.

Brouardel, in cases of *incomplete ankylosis*, holds that the resultant incapacity varied between 0–10 per cent. on the one hand and 30–40 per cent. on the other.

## Ankyloses and Limitation of Movement of Toes

Ankylosis of the toe joints is usually a sequel of phalangeal fractures, which, as radiography has shown, may be very easily overlooked.

The big toe resembles the thumb in that lesions thereof entail graver functional disabilities than in the other toes. But both in the case of the great toe and of its fellows it must be well

recognized that, while in sequence to *injury* they may gravely incapacitate the victim through the pain experienced on walking and standing, still such suffering tends to disappear with continued use.

As for the type of ankylosis, it is obvious that *extension* is the most *favourable* position. On the other hand, *hyperextension*, *flexion*, or *lateral displacement* with the toe overriding its neighbour constitute *unfavourable* positions.

The toes, as appendages, are of secondary importance, and their loss may be sustained without gross inconvenience. In their instance, as in the finger, amputation is sometimes preferable to ankylosis in *malposition*.

*Assessment*

Imbert suggests in the case of the big toe if ankylosed in *malposition* 15–20 per cent., and for such when fixed in a *favourable* position 8–12 per cent.

In the case of the other toes Remy allots 3 per cent. for those fixed in *extension*, 7·5–15 per cent. when in *malposition*.

## Adaptation in Ankyloses of the Lower Limb

Inasmuch as the data obtainable—as elicited by the German Imperial Assurance Authorities—relate for the most part to ankyloses following fractures, we have, to avoid needless repetition, deferred our discussion of this question to the chapter on "Fractures of the Lower Limb."

# TABLES OF EVALUATION OF ANKYLOSIS OF THE LOWER LIMB

## HIP JOINT: TOTAL ANKYLOSIS

| Angle of fixation. | Remy (according to Imbert). | Brouardel. | Ollive and Le Meignen. | Wiener Schema. | Imbert. | French Guide Barème. | Suggested. |
|---|---|---|---|---|---|---|---|
| | % | % | | % | | % | % |
| Favourable, viz. *extension.* | 37·5 | 30–80 | 70–90 % except in case of one who sits at work or whose infirmity is slight. | 58 | 40–50 % if no compensatory curve in spinal column. | 40–50 | 40–50 |
| Unfavourable, viz. *flexion.* | 30 | — | — | 50–75 | 60–70 % if compensatory curve is sufficient to correct deformity, 80 % if not. | 60–70 | 70–80 |

## PARTIAL ANKYLOSIS OR LIMITATION OF MOBILITY OF THE HIP JOINT

| Arc of mobility. | Remy. | Imbert. | French Guide Barème. | Suggested. |
|---|---|---|---|---|
| | % | % | % | % |
| Favourable: flexion from the vertical to 45°. | 15–20 | 15–20 | 15–20 | 15–20 |
| Unfavourable: minor degrees of flexion according to degree. | 30–35 | Perceptible increase over Remy's estimate. | 30–35 | 40–50 |

## FLAIL-LIKE CONDITION OF HIP

| Remy. | Imbert. | Suggested. |
|---|---|---|
| 70 % | 70 % | 75 % |

## TOTAL ANKYLOSIS IN THE KNEE

| Angle of fixation. | Wiener Schema. | Le Jurisclasseur des Acc. du Travail. | Austrian Imperial Office. | Remy. | Ollive and Le Meignen. | Brouardel. | Golebiewsky. | Imbert. | French Guide Barème. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | % | % | % | % | % | | % | % | % |
| Favourable: in complete or almost complete extension. | 41 % for rectilinear ankylosis | 48–50 | 25 | 15–20 | 20 | 20–60 | 50–60 % for complete extension. | 30–40 | 30–40 | 25–45 |
| Unfavourable: in hyperextension (rare), much more frequent in flexion. | 50 % | — | 30 | — | 50 % and more. | — | 70–80 % when wearing of apparatus necessary. | 60–65 | 60 | 50–60 |

## PARTIAL ANKYLOSIS: LIMITATION OF MOBILITY IN THE KNEE

| Arc of mobility. | Remy. | Brouardel. | Le Jurisclasseur des Acc. duTravail | Imbert. | French Guide Barème. | Suggested. |
|---|---|---|---|---|---|---|
| | % | % | % | % | % | % |
| Favourable: from extension to 25° or 45° of flexion. | 0–15 | 10–40 | 15–30 | 15–30 | 10–20 | 10–20 |
| Unfavourable: minor degree of flexion according to degree. | 10–20 | — | — | — | 20–30 | 20–30 |

## FLAIL-LIKE CONDITION OF KNEE

| Austrian Imperial Office. | German Law. | Wiener Schema. | Remy. | Imbert. | Suggested. |
|---|---|---|---|---|---|
| 30–40 % | 50 % | 50–75 % | 30–40 % | 50 % | 50–60 % |

TOTAL ANKYLOSIS IN THE FOOT (ANKLE AND TARSAL JOINTS)

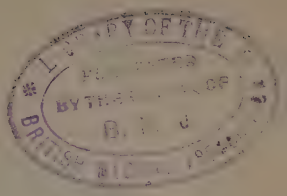
| Angle of fixation. | German Law. | Wiener Schema. | Ollive and Le Meignen. | Golebiewsky. | Remy. | Brouardel. | Imbert. | French Guide Barème. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|
| Foot at a right angle with leg. | % 33–40 (Le Jurisclasseur). | % 41 maximum. | % 15–20 | % 33 maximum. | % 5 | % 10–25 minimum. 40–60 maximum. | % 15–20 | % 15–20 | % 15–25 |
| Foot in a varus or valgus position. | — | 50 | — | — | — | — | Up to absolute incapacity, 100%. | 30–50 | 50–70 |

LIMITATION OF MOBILITY OR PARTIAL ANKYLOSIS IN THE FOOT (ANKLE AND TARSAL JOINTS)

| Arc of mobility retained. | Remy. | Brouardel. | Imbert. | French Guide Barème. | Suggested. |
|---|---|---|---|---|---|
| Favourable: movements oscillating 15° around a right angle—namely, from 75° to 105°. | % 0–10 | % 0–10 | % 0–10 | % 0–10 | % Up to 10 |
| Unfavourable. | 5–25 | 30–40 | 5–25 %, increased if stiffness very marked. | 10–30 | 5–25 |

ANKYLOSES OF THE TOES

| Site of ankylosis. | French Law. | Imbert. | | Remy. | | French Guide Barème. | | Suggested. | |
|---|---|---|---|---|---|---|---|---|---|
| | | In extension | In flexion or hyper-extension. | In extension. | In flexion. | In extension. | In hyper-extension. | In extension. | In flexion or hyper-extension. |
| | % | % | % | % | % | % | % | % | % |
| Great toe. | 7·25 (Seine Tribunal). | 8–12 | 15–20 | — | — | 8–10 | 15–20 | 10 | 15–20 |
| Other toes. | 3 % for ankylosis of the 2nd articulation of the 2nd, 3rd, 4th toes (Duchaffour). | 3 | In flexion, 7–15 | 3 | 7·5–15 | 3 | 7–15 | 3 | 7–15 |



# CHAPTER XV

## FRACTURES: THE GENERAL PRINCIPLES OF EVALUATION

### Introductory Remarks

FRACTURES constitute one of the most frequent forms of injury to which the human frame is liable. Our interest in this class of lesion—always lively—became accentuated with the advent of the Compensation Laws. Experience thereunder clearly showed, not only that the appropriateness and adequacy of our treatment of such injuries was doubtful, but also that a radical change in medical thought was impending. For reflection upon the *end-results of therapy* made clear that the true object thereof was but dimly realized. In other words, that obsessed with the proximate end—*anatomical repair*—we had, if not overlooked, at any rate failed to grasp the great essential—*restoration of the functional efficiency of the damaged limb.*

Iconoclastic in truth—this change of attitude—involving a breaking away from the traditional conception—viz. that union of the fragments signalled completion of cure. Slow indeed have we been to recognize that *anatomical repair is but a prelude to functional restoration.* That we have even now taken to heart the obvious truth of this axiom is in no small measure due to the decrees of civil legislation—the refusal of judge or jury to admit "cure" of the fractured limb pending acquisition of its *functional* aptitudes. Even to this day French experts draw a distinction—one as it seems to us somewhat ironical—between *la consolidation chirurgicale* and *la consolidation juridique*! How discreditable to our clinical insight as a profession this arbitrary differentiation, how flattering to the amour-propre of the jurist that he, not the surgeon, was the first to realize the true goal of therapy—restoration of *functional* capacity! For obviously from the standpoint of evaluation of fractures, *anatomical union* is but a purely secondary consideration—to be weighed in its effect, favourable or otherwise, on *functional efficiency.* With this brief prelude we may now pass on to discuss the component elements which in the aggregate constitute the groundwork of assessment.

## General Principles of Evaluation

In attempting to evaluate the *functional* efficiency of a limb, which has been the seat of fracture, we are not, strictly speaking, concerned with its mode of production or whether the conditions under which it took place constitute an "industrial accident" or an "accident of war."

Our attention, on the other hand, must be concentrated on the *end-results* of the treatment adopted, whether operative or non-operative. Such a case does not or should not come up for final assessment until all the resources of therapy, surgical or otherwise, have been exhausted. It is then, and then only, that the question comes up for solution: *To what extent, if any, is the functional efficiency of the limb depreciated?*

Confronted with an instance of fracture at this stage, upon what data are we to found our opinion as to the degree to which the pristine capacities of the limb are impaired? Our decision on this point will rest upon the results of our investigation of:

(*a*) The central or bony lesion.

(*b*) The collateral phenomena associated therewith.

### The Central Lesion

In the process of evaluation this must be envisaged from two aspects: (1) the site of the lesion; (2) its mode of repair.

#### *Site of Fracture*

The exact location of a fracture is very important, if viewed in light of the degree of *functional* efficiency that will most probably ensue, and this for divers reasons. Thus *perfect coaptation* of the fragments is less likely to occur at some sites than at others. It is for this reason that the prognosis of *intra-* and *juxta-articular* fractures is notoriously sombre. More or less residual *functional* impairment, especially in the *ankle*, *wrist*, and *elbow*, is almost invariable, so much so indeed as to leave little doubt that the treatment of these fractures by the older methods is inadequate. They fail to ensure that perfect coaptation of the fragments so essential for good functional results. Moreover, the frequently associated exuberant or vicious callus inevitably interferes with the normal play of the articular surfaces. It is therefore probable that until operative take the place of non-operative methods the outlook—*qua* restoration of function—in *intra-* and *juxta-articular* fractures will not substantially improve.

Again, the location of the fracture is of importance in that

at certain sites there is greater liability to *involvement of nerves.* Thus the lesion, if situated at the upper end of the humerus, may injure the *circumflex*; if in the shaft, the *musculo-spiral* nerve. Again, in the lower limb, if the fibula is fractured at its upper end, the *peroneal* nerve may be implicated, with resultant talipes equino-varus.

In fractures of the shafts of the tibia and fibula a vicious union with exuberant callus is not uncommon. Therewith is often associated *thrombosis* and *trophic* troubles. Enough has been cited to demonstrate the importance of the *location* of the fracture, as influencing the outlook of the limb in a *functional* sense.

### *The Mode of Repair*

The ultimate usefulness of a fractured limb will obviously depend on the manner in which union of the fragments is achieved, whether or no *good* and *secure alinement* has been attained. The desired end—restoration of *function*—may be wholly or in part defeated. It may be *shortening*, with or without *vicious union*, or simply sheer exuberance of callus, which mars the efforts of therapy. Or haply the healing agencies may be delayed or remain in abeyance (non-union).

In the union of a fracture we have to take cognizance of two processes of callus formation. First, the transitory or *subperiosteal* callus—a preliminary osseous casing destined to undergo partial or complete absorption. Secondly, the permanent or *interfragmentary* callus which, while undergoing consolidation, leans as it were for support on the periosteal formation. The manner in which these solidifying factors fulfil their respective rôles varies according as to whether a good alinement has been secured and infection obviated.

Given a simple fracture—*well reduced* and *non-infected*—the subperiosteal callus quickly becomes absorbed and the interfragmentary portion alone persists. It is under these conditions that the *functional* end-results reach their highest pitch of excellence. On the other hand, if we fail of reduction, and *overlapping* ensue, and, worse still, *infection* supervene, then the orderly sequence is disturbed. The subperiosteal callus, instead of undergoing absorption, persists and becomes voluminous, the more so if the fragments override. *Shortening* under such circumstances is inevitable and no less deformity, as the thickness of the shaft is doubled by the overlapping of the severed ends. With this brief prelude we now pass on to discuss the adverse effect of irregular or defective modes of anatomical repair on the *functional* end-results of a fracture.

*Union with Shortening*

This as a rule is referable to *overlapping* or *angular deviation* of the fragments, but nevertheless it may supervene in the absence of both. Witness the frequency with which in *gunshot fractures* of the femur, neither angulation nor overlapping is present, and yet *true shortening* ensues—due to *loss of substance* either primarily or secondarily through a prolonged *osteomyelitis.*

*Its Effect on Functional Efficiency.*—For the avoidance of fallacy it is well to recollect that *asymmetry* in length of the lower extremities is the rule rather than the exception even in normal persons. But, generally speaking, in the evaluation of fractures this natural disparity is so minimal as to be negligible.

*Upper Limb.*—Shortening of the *humerus* due to *loss of bony substance* entails no marked functional inconvenience. But if it affect one of the two bones of the *forearm* it is of importance, in that it forms an obstacle to consolidation and so may be responsible for the development of a *pseudarthrosis,* the functional disabilities attaching to which we shall consider later.

*Lower Limb.*—In fracture of the *thigh,* if shortening does not exceed 2 cm. or 4-5ths of an inch, it is negligible, being nullified by simple inclination of the pelvis. If it exceeds 4-5ths of an inch there is more or less limping. Ollive and Le Meignen consider that any degree of shortening below 3 cm. should not be compensated *unless associated with other lesions.* Shortening may be termed of high grade when it exceeds two inches, and Brouardel held that such predicated a marked degree of industrial incapacity in certain trades.

In view of the fact that *gunshot* fractures of the femur often entail considerable shortening, even *up to six inches,* in our experience it cannot be gainsaid that the functional disability incurred is very pronounced, especially in those whose occupation is not a sedentary one.

It should be regarded the more gravely when due to *loss of substance* in the long axis of the bone. It is less serious if shortening is referable to *overlapping of fragments* or *angular deviation* thereof. For these latter are usually amenable to osteotomy. Reduction with continuous extension can then be effected and usually with excellent functional results. The evaluation of the residual functional or working capacity in a case of shortening of the femur should, if the same be amenable to operation, be postponed until the results of such procedures admit of exact appraisement.

According to Sir Robert Jones, in fractures of the *tibia* and

*fibula*, if the alinement be good, slight shortening does not impair the usefulness of the limb.

### *Exuberant Callus. Vicious Union*

Overgrowth of callus is in the main of *subperiosteal* origin, and the most pronounced illustrations thereof are to be met with in *infected fractures with fistulæ*. Indeed, the factor—Infection—looms large in excessive callus formation.

More interesting from the point of view of function and therefore of evaluation is the fact that the callus thus formed may be intensely *sensitive*. In addition we have to recollect that the callus, even when happily insensitive itself, may involve a *nerve*, with resultant neuralgia or neuritis. Also it may interfere *mechanically* with the play of *muscles* or *tendons*, or possibly obstruct the flow of blood from the part.

In the production of *vicious union* also the element *infection* plays a leading rôle. Thus in *gunshot fractures* loss of substance through the associated osteomyelitis may be responsible for union of the fragments at an angle, while in other instances it is to be referred to the nature of the wound precluding all possibility of *adequate fixation of the fractured limb.*

Given *angular deviation* of the fragments, *shortening* is inevitable and likewise *deformity*. The latter, too, is accentuated by the volume of the callus thrown out under such circumstances, the tendency to exuberance being even more marked in the presence of *infection.*

The evil effects on *functional* recovery in vicious union, always sufficiently marked, reach their zenith in the case of fractures of the *forearm.* Here, owing to coalescence of the bones of the forearm, total or partial limitation of the movements of pronation and supination ensue, with consequent depreciation in usefulness of the hand.

### *Delayed Union and Pseudarthrosis*

Failure of consolidation may be said to have arisen when union of a fracture has been postponed beyond the time usual for the achievement of such coalescence of the fragments. According to most authorities the average time necessary for union of a simple fracture in good alinement in a young and healthy subject varies with the size of the bone—in the femur, two months ; in the bones of the forearm, one month.

Union is delayed when (1) alinement is imperfect, and the permanent callus is almost wholly of subperiosteal origin ; (2) the fracture is comminuted ; (3) the fracture is comminuted and the

seat of *suppuration*. In our experience, four to six months are necessary for consolidation of a fractured femur due to a *gunshot* wound, and this indifferently whether it be accompanied or not by fistulæ. A further postponement would in our opinion justify the assumption of delayed union.

All modern authorities contend against rash conclusions as to the *permanent* absence of any efforts at *osteogenesis*. As a corollary, therefore, we would issue a caution against premature affirmations as to the *permanent* incapacity of the affected limb. This certainly not until all artificial methods of stimulating osteogenesis—damming, percussion, etc.—have been perseveringly pursued. For, as Sir Robert Jones observes: "Even after months osteogenetic changes leading to consolidation will take place in a fracture considered to be permanently un-united."

*Non-union or Pseudarthrosis.*—The casualties of war have added considerably to our knowledge of the various types of pseudarthrosis. In gunshot wounds involving the *shaft* of a bone a false joint may ensue through actual loss of bony substance. Obviously the result will differ according as to whether the solution of continuity affects the upper or lower segment of a limb. In other words, whether it involve *one* bone—the humerus or femur —or *two* bones, as in the forearm and leg.

If the loss of substance involve the shaft of only *one* bone, e.g. the femur, union is fortunately often secured by the ascent of the lower fragment. This happy result is, however, less frequently attained in the case of the humerus, which of all bones is the most liable to a *diaphyseal pseudarthrosis*.

In limb segments with *two* bones we may envisage the following possibilities: Assume that only *one* bone is fractured, the other remaining intact, then this latter will prevent ascent of the lower fragment of its fractured fellow. The same will follow if in a *dual* fracture one of the bones unites with little or no shortening. A pseudarthrosis may then result through failure of ascent of the lower fragment in the fractured diaphysis. This form of false joint is more often met with in the forearm than the leg, and while the *two bones may each be the seat of pseudarthrosis* the involvement of one bone only is much more common.

A special form of pseudarthrosis occurs when the loss of substance involves the *epiphysis* and the neighbouring portion of the shaft, and this without subsequent ankylosis of the adjacent joint which then remains flail-like. This variety usually occurs in the *upper limb*, in the following order of frequency—shoulder, elbow, wrist; but is also met with in the *lower limb*, most commonly in the hip.

*Differential Diagnosis of Delayed Union and Pseudarthrosis*

Not a little obscurity obtains in regard to the clinical differentiation of delayed as opposed to permanent non-union. Certainly no arbitrary distinction on the basis of a " time limit " is reliable. This for the reason that a fracture at the very moment of its incidence may by the intrusion of *muscle* or *fascia* between the fragments take on at once the *facsimile* of a pseudarthrosis. Or at the opposite extreme, how often during the present war has it transpired that some focal irritation or infection at the site of a fracture has delayed union almost indefinitely. Yet, given removal of the source of irritation, how often has union, almost despaired of, swiftly ensued. On a " time limit," therefore, it is impossible to draw a distinction between delayed union and pseudarthrosis. The two criteria are (*a*) the evidences gleaned from clinical examination; (*b*) the data afforded by skiagraphy.

(*a*) The distinctive characters of a *pseudarthrosis* may to some extent be established by *palpation* of the affected part. Its existence will be indicated by *abnormal mobility* and this of *painless* character. In addition œdema is absent and the soft parts adjacent to the fracture do not retain their suppleness. If, on the other hand, *mobility is less pronounced*, and moreover causes *pain*, while not only the bone, but the soft parts are *swollen* and *œdematous*, it predicates *delayed union*.

(*b*) The evidence culled from the skiagraph, while of infinite value, labours under the disadvantage of being readily misinterpreted. The salient point to recognize is that, though union in a clinical sense may appear to be sound and the permanent callus *transparent*, even so the process of ossification may not be complete.

The callus may not yet be capable of withstanding the stresses and strains inseparable from exercise or the maintenance of the body weight. How frequently in such cases has the apparently solid bone given way or bent—to the discomfiture of the surgeon! Confronted with these appearances—the hall-mark of *immature* callus—our diagnosis should lean in the direction of *delayed union* rather than pseudarthrosis. But in few cases will the revelations of a single skiagraph be so unequivocal as to admit of a dogmatic inference either way. In all doubtful cases, therefore, the taking of a *series of skiagraphs* at intervals of a month is indicated. Such alone will enable us to identify that progressively darkening shadow which marks the progress of ossification—the march to maturity of the inter-fragmentary callus.

Conversely, as we have often observed, in a *true pseudarthrosis* we note the loss of substance—the interfragmentary hiatus—and this not surrounded by a grey nimbus of indefinite outline, but marred by opaque masses of varying shape, though sharp contour—reminiscent of those familiar to us in amputation stumps.

*Delayed Union and Pseudarthrosis in Relation to Function*

It may be said that no case of fracture has, in the words of the Warrant, reached its "final condition" if it can be identified as a case of *delayed union*. Consequently the final assessment of the *functional* impairment that may or may not have ensued must be postponed until sound union has been secured.

Given, however, that a definite *pseudarthrosis* exists, how are we to appraise the degree of the resultant functional inefficiency? This may best be attained by dealing seriatim with pseudarthrosis as it affects the different bones.

*Humerus.*—Indifferently whether the pseudarthrosis be of *diaphyseal* or *articular* site it does not, despite the existing flail-like mobility, necessarily follow that the limb is absolutely useless. For if the continuity of the bone is lost, the muscles are able to approximate, and this to a very remarkable extent, the separate portions of the shaft.

To the superficial eye the limb lies inert by the side, swinging idly to and fro in apparent utter helplessness. Yet following forceful voluntary innervation or strong electrical stimulation, the arm as it were knits itself up. If it be at the shoulder—the deltoid—if in the arm or the elbow, the long muscles of the arm spring into action, and upwards the lower fragment rises to rest on its *point d'appui*—the upper portion of the shaft. In this way solidity, though ephemeral, is imparted to the flail-like limb, and, with the elbow bent, wrist and fingers come into play. Needless to say, all this depends on whether the efficiency of the muscles of the limb is in no way compromised.

*Elbow.*—Pseudarthrosis, if present in *both* bones of the forearm, entails serious if not absolute loss of power. Nor can it be gainsaid that even if the *radius* alone be implicated, the resultant disability—due to limitation, partial or total, of *pronation* and *supination*—is very pronounced. This because of the associated feebleness of the finger movements, with consequent reduction of the *functional efficiency of the hand.* The same, given loss of the *lower epiphysis of the radius*, is even still more marked. The hand forthwith deviates outwards, and supination being impossible, the grip of the fingers under such conditions

has impressed us with its feebleness. If the pseudarthrosis be located in the *ulna* it involves much less disablement—the more so if it be located in the *lower half* of the shaft. Unfortunately, the disability associated with pseudarthrosis of the forearm is—e.g. in *gunshot fractures*—but too liable to be accentuated owing to coincident involvement of the *nervous* or *muscular* structures of the forearm.

In the *lower limb*, while diaphyseal and articular pseudarthroses may occur in the *femur* and *knee*, they are comparatively rare, and such observations as we purpose making in this connexion will be found in later chapters devoted to detailed consideration of the fractures of the lower limb. Here our discussion will be limited to pseudarthroses of the *leg*, which, though not common, are more so than in the upper segment of the extremity.

*Leg.*—The primary desideratum in the lower limb being its *solidarity* as a means of support, it is obvious that a pseudarthrosis of the *tibia* is infinitely more serious than one located in the fibula. Still, although loss of substance of the *fibula*, even when extensive, may be of little or no functional import, certain reservations must be made. Thus all depends on whether or no there is *loss of the external malleolus*. For if so we cannot overlook the functional inconvenience caused by the resultant *outward deviation of the foot*.

In pseudarthrosis of the *tibia* the essential point is the extent to which loss of substance has been sustained. The more extensive the bony hiatus the more difficult the rôle of the surgeon in making good the same. Thus, for example, it may be such that even after resection of the fibula contact of the isolated portions by means of a *bony graft* of sufficient length and thickness may be impossible of attainment. But such are the resources of modern surgery that amputation is rarely if ever called for, even in the worst forms of pseudarthrosis. More than this, the ingenuity of the surgeons, as displayed by the *implantation* of fibula into tibia, the *substitution* of one diaphysis for the other, and so forth, has immeasurably improved the outlook of these cases as regards the ultimate functional efficiency of the limb.

## Collateral Phenomena

Certain *post-traumatic* accompaniments or sequelæ are met with very commonly in fractures, and according to their degree and persistence depreciate the ultimate usefulness of the limb. Of variable character and origin, they are referable to disorders of the related *nervous*, *muscular*, *articular*, and *vascular* structures, and to their consideration we now pass on.

*Nervous Disorders*

These may be of subjective or objective character and naturally the former are most difficult of establishment. We allude of course to *pain*—that bugbear in all cases in which the responsibility of the State or that of the individual employer is involved. As to the relative frequency of pains after apparent cure, they are more often complained of in the *lower* than in the *upper* extremity. To establish their authenticity is often difficult, and the more so in that they are referable to divers causes. These call for differentiation and exclusion before the idea of *simulation* or *exaggeration* can be entertained.

If the fracture be *compound*, it is but natural that the newly formed tissue of the *cicatrix* should be the seat at least of tenderness if not of pain. But if such be its origin the pain will tend to diminish gradually with each passing week. But even if assured that this is the true cause, it indicates, not abstention, but rather *resumption* of work—the necessary contacts inseparable from labour tending to deaden the hypersensitiveness.

On the other hand, the pain may be the index of an imperfect cure—due to the *immaturity of the callus*—as disclosed by skiagraphy. This is notoriously the case in fractures of the *os calcis* in which pain on standing may persist for months or even years. In other instances, too, the pain may be referable to *compression of a related nerve trunk*, and its duration indefinite unless amenable to surgical intervention.

Now pain when present hinders the achievement of *functional adaptation* to the consequences of a fracture. It may, moreover, in cases requiring apparatus delay accommodation thereto—this through persistent sensitiveness of the structures.

In conclusion, therefore, pain must be reckoned with as a possible cause, not only of delayed resumption of work, but *per se* of a definite *incapacity for work*. In cases in which monetary considerations are involved, establishment of the *reality* of the pain is a *sine qua non*, but for elucidation of this point we would refer the reader to our work on "Malingering."

*Other Nervous Sequelæ.*—In the *upper* limb especially, immobilization may result in *thinning of the skin* of the fingers, which may retard the acquirement of functional adaptation. It sometimes supervenes apart from ascertainable nerve lesions, but fortunately such is a rare contingency.

If, on the other hand, there be *direct implication* of, or *secondary involvement* of, the nerve in callus, these *trophic* troubles may reach a high grade and are usually associated with sensory and motor disorders, anæsthesia, and variable degrees of

paresis, if not paralysis. In such event the nerve lesion is, of course, the *dominant factor in evaluation.*

### *Muscular Atrophy*

In approaching a study of this most frequent complication of fractures, it is well to be alive to certain sources of fallacy.

(1) The muscles of a limb may appear to be atrophied as those of its fellow have, through overwork, become hypertrophied.

(2) Muscular atrophy may be persistent and yet not compromise industrial capacity.

(3) In all cases of muscular atrophy, not only the degree of wasting, but the electrical reactions must be investigated, for functional efficiency is compatible with a certain degree of atrophy.

Forewarned of such possibilities of error we are infinitely less liable to rush to rash conclusions as to the industrial incapacity, as based upon the findings of *mensuration.* Indeed, this criterion is pre-eminently unreliable. The common method is to estimate the degree of the muscular wasting by comparing the perimeter in both limbs, as measured at points *equidistant from a bony prominence.* Here we are open to the fallacy that the muscular masses may not be of symmetrical development in the two limbs. The maximum bulging of the calf is not always in both legs located at the same distance from the malleolus or anterior tibial apophysis.

The safer plan is to take the perimeters at the point at which the muscular masses are most highly developed, and this indifferently whether these levels are equidistant from a given point.

It is also important that we exclude the presence of *œdema* which, when existing, may *mask wasting of the subjacent muscles.* For the œdema by its presence tends to equalize the perimeters of the two limbs which otherwise would show a disparity.

Lastly, the *overriding of the fragments* may substantially increase the perimeter of the limb, and so lead to erroneous conclusions as to the absence of atrophy, when actually existing.

We see, therefore, that the deductions from mensuration are but too apt to prove a delusion and a snare. Alive to these drawbacks we are therefore inclined to pin our faith to *palpation.* The " feel " of wasted muscles is very characteristic and may in doubt be supplemented by electrical examination. For from the point of view of industrial capacity muscular atrophy—*unless correlated with a decrease in functional efficiency*—is without significance.

Again, it is well to recollect that in *gunshot* fractures the muscular masses even though only pierced by a bullet may undergo progressive *atrophic sclerosis* with *retraction*. The normal equilibrium existing between the muscular groups ruling the joint movement is thus necessarily deranged, and the efficiency of the limb compromised by the sequential joint deviation of vicious type.

Lastly, given a fracture associated with *nerve lesions*, paralysis of the related muscles may ensue. Their antagonists therefore becoming predominant, there may ensue joint deviations, and this at a site remote from the fracture. We see, therefore, how largely the factor—muscular atrophy—looms in the evaluation of the consequences of a fracture, as relating to the ultimate *functional efficiency* of the limb.

### *Articular Troubles*

Ankylosis, partial or complete, is not an infrequent sequel of fractures, both in the upper and lower limbs. Their severity varies according to their mode of origin.

It is clear that stiffness of a joint may be merely a consequence of the *immobilization* of the limb. If so, under appropriate treatment it usually disappears completely. On the other hand, ankylosis may be due to direct implication of the joint cavity—an *intra-* or *juxta-articular* fracture. In such cases complete restoration of mobility is improbable. Still, one has to recall that the exuberant callus so often associated therewith constitutes in some instances the sole obstacle to increased range of movement, and increased mobility may follow removal of the offending bony mass. Such may occur in, for example, the *shoulder joint*, but—even if inoperable—the rotation of the scapula will to some extent compensate for the limitation in amplitude imposed. Again, in the *knee*, following *osteomyelitis* of the lower end of the femur, an inflammatory hyperostosis may act as a mechanical bar to freedom of movement.

Nor can we overlook the fact that in *gunshot fractures* an ankylosis may ensue through *infection* of either the *joint structures proper* or of the *periarticular soft parts*, with resultant capsular thickening and adherence of the tendons to the surrounding structures.

Failing the possibility of surgical intervention, the measure to which the *ultimate functional capacity* of the limb—in fracture complicated by ankylosis—will be sacrificed depends on the *angle of fixation*, whether favourable or unfavourable. In *compound* fractures—especially if attended by a wound on the

*flexor* aspect of the joint—the mobility of the joint may be compromised by subsequent retraction of the *scar tissue.* In *partial ankylosis* the effect on functional efficiency will vary according to the *arc of mobility retained,* whether favourable or unfavourable.

### *Œdema*

Of the circulatory disorders that complicate fractures one of the most common is certainly œdema, which persists for a variable period after bony consolidation. The extent of the *œdema* stands in no constant relation to the severity of the bony lesion. Its causation is obscure, though unquestionably *postural* factors influence its degree. This is rendered obvious by the exaggeration thereof which so often ensues when the subject begins to be up and about. It may, however, assume a more serious form—viz. *solid œdema*—in which event its duration tends to be more prolonged.

In general, œdema in relation to fractures is fortunately benefited by the resumption of exercise. Persistent slight œdema is not uncommon. But even so it does not forbid the subject pursuing his occupation. It may therefore be regarded as a temporary phenomenon—save in those rare instances in which it becomes hard, resistant, and withal *painful,* in which case a state of *permanent incapacity* may result. There are instances of course in which *compression of the veins,* with or without coincident phlebitis, is responsible for the œdema. The prognosis in this instance is intimately bound up with the evolution of the causal factor. While the œdema persists it does of course predicate absolute incapacity. Moreover, rash prophecies as to the duration thereof are to be deprecated in view of the tendency to recurrence so often displayed by *phlebitis.*

### Summary

Now to enumerate our conclusions as regards the central lesion—its effects on the ultimate efficiency of the limb.

(1) *A close interdependence obtains between the character of the anatomical union and the ultimate functional results.*

(2) *In a simple fracture, given good alinement, sound union, and the absence of complications, such is generally correlated with excellent functional results* in (*according to the Fracture Committee's Report*) 90·7 per cent. of cases.

(3) *With faulty alinement the ultimate functional efficiency of the limb is usually impaired and this in general in direct ratio to the mechanical imperfections thereof.*

Thus the Committee above cited found that in instances in which *vicious union* ensued the *functional* result in 57·3 per cent. of cases was "bad." Of the intermediate group, in which the anatomical repair was defined as "moderate" or "bad," in only 29·7 per cent. of cases was a good *functional* result obtained.

### *Functional, not Anatomical, Results the Basis of Evaluation*

Now while the foregoing pronouncements are substantially correct—viz. that *ceteris paribus* good alinement favours the restoration of functional efficiency—yet nevertheless the assessor must not base his evaluation purely on the *anatomical* findings as revealed by *skiagraphy* or otherwise.

For *no constant correlation exists between the anatomical or objective state and the degree of functional efficiency.* It is astonishing to what an extent the functional capacities of a fractured limb will ultimately be regained even when its faultiness of repair is such as would apparently negative all such possibilities.

To sum up, in evaluation *functional* results are more important than anatomical accuracy—viz. perfect reduction and no deformity.

Indifferently whether it be a question of a soldier's pension or an industrial worker's compensation, it is the *functional aptitudes* of the limb that are the salient consideration. What can the man do with his quondam fractured arm or leg ? That is the point at issue, and it is upon the results of our investigation of the functional capacities of the injured member that we must base our estimate of the depreciation in working powers, if any, that he has incurred thereby. To this end we should examine most carefully the *mobility of the joints,* their *amplitude of range,* the *measure of resistance the muscles can overcome,* and so forth. In this way we may estimate how far the functional efficiency of the limb falls short of normal, in other words, the "proportion of the degree of disablement."

### *Collateral Phenomena in Relation to Evaluation*

As perusal of the succeeding chapters will abundantly show, the problem of evaluating the consequences of a fracture is often highly complex. The limb must be envisaged from all aspects—our cynosure not confined to the fracture alone.

For the gravity of the bony lesion itself is in truth often o'ershadowed by that of the *collateral* or associated phenomena. Thus a fracture of the humerus may heal soundly, but what of the correlated injury to the musculo-spiral nerve ? The grave

functional disability occasioned thereby dwarfs all else—becomes the dominant factor in evaluation.

Albeit in yet another instance the *primary*—the bony lesion—comes again to the fore. It may be a *pseudarthrosis* which sways the question at issue. If so, its serious crippling influence will be the measure wherewith to gauge the resultant incapacity.

But with the present war, more complex still are the problems that beset us. For in *gunshot fractures*, not the bone only, but *nerves* or *muscles*, or *both*, may be simultaneously damaged. But no matter how multiple the individual lesions, they cannot as *anatomical* flaws, taken seriatim, constitute the basis of evaluation. They must be judged in light of their effect, *not individually*, but in the *aggregate* on the *functional efficiency* of the limb.

## CHAPTER XVI

# FRACTURES OF THE UPPER LIMB

### Fracture of the Clavicle

Of all the bones in the skeletal structure the clavicle is the one that most often sustains fracture. Rarely due to direct, it is generally the result of *indirect* violence—a fall on the shoulder or hand.

The site of fracture is commonly at the middle third, next the outer, and, rarest of all, at the inner extremity. Displacement, deformity, and shortening are the rule, and the latter may be as much as two inches. Despite these, the functional usefulness of the arm is seldom much interfered with. But consolidation may be much delayed if the fracture be compound and comminuted, as in those the result of *gunshot* wounds. For the rest, even in subcutaneous fractures the prognosis may be darkened by the incidence, rare, of complications, e.g. direct injuries to the main nerves and vessels of the limb, or indirect through pressure on these structures by exuberant callus.

#### *Average Period of Incapacity*

These fractures usually unite swiftly and the bone generally becomes firm at the end of four weeks. But when consolidation is considered in relation to *industrial capacity*, this more or less academic period undergoes prolongation. Certainly our experience under the Compensation Act does not warrant us in asserting that the workman resumes employment at the end of a month. His period of absence is more likely to be extended to two, if not two and a half months, which Forgue and Jeanbrau cite as the average. We have to recollect that after union has occurred a certain period must elapse before the customary mobility of the shoulder is restored. Austrian statistics, based upon seven hundred and thirty cases, give as an average forty-seven days before resumption of work. Gallez, who has devoted much study to this question, places the average as between two to three months. Lastly, we have to admit inevitable extension of the period if there be complications which call for surgical inter-

vention, e.g. the *correction of deformity*, the *release of nerves from pressure*. Non-union is fortunately rare.

## Factors in Evaluation

These may be discussed under two headings: (1) the central lesion; (2) the collateral or associated phenomena.

### *The Central Lesion*

*Shortening* through overlapping of the fragments may result, but, unless extreme, does not—when union has occurred—entail incapacity. In this event it may be that the attached muscles, through undue approximation of their points of attachment, act somewhat at a mechanical disadvantage.

*Vicious Union.*—Æsthetic considerations are scarcely worthy of note in this connexion, but nevertheless excessive callus formation may cause *pressure symptoms*—pain and incapacity for work.

*Multiple and Comminuted Fractures.*—Their gravity is very real, and even after consolidation the working powers may be seriously depreciated. In the *compound comminuted* fracture the necessarily more prolonged immobilization of the parts brings its Nemesis in the shape of profound and persistent muscular atrophy—this especially if the wound become infected. In such cases some degree of permanent incapacity will almost certainly remain.

*Pseudarthrosis.*—Non-union may occur, but if there is enough fibrous tissue developed between and around the un-united ends to prevent movement, then there will not be much interference with function. But if the ends move freely one upon the other the usefulness of the arm is diminished.

### *Collateral Phenomena*

To all intents and purposes these may be summed up as those incidental to associated lesions of the nerves. For from the functional point of view these constitute the most common and the most serious source of permanent incapacity. The amount of callus around the broken ends may be large, with resultant pressure and pain in the large trunks. Not only subjective phenomena, but localized *paresis* or very extensive *paralysis* may ensue—so widespread as to constitute functional impotence of the limb.

Further reference to this point will be made in the chapter on "Injuries to the Nerves."

*Scapulo-humeral arthritis* sometimes follows fractures of the clavicle, and if severe may add greatly to the disability. Such is happily relatively rare, but when it takes the form of a *sub-acromial bursitis* it may be one to two years before painless mobility of the shoulder throughout its full range is secured.

### *Assessment*

Given *sound union* and *good alinement* a fracture of the clavicle does not entail any permanent incapacity. But if the same be associated with *muscular wasting* it predicates some degree of disability. The same, too, must be gauged in light of whether the man be *right-* or *left*-handed. If the former, and the fracture be in the left arm, it may be assessed at 1 to 5 per cent., and in the right at 5 to 10 per cent.

If, however, there be *periarthritis* involving the subacromial bursa, the *initial* disability may, as we have seen, be absolute, and equivalent therefore to *functional loss* of a limb—viz. to be rated at 70 to 60 per cent., and this gradually lowered *pari passu* with the improvement in mobility until, in the words of the Warrant, "it reaches its final condition." The residual disability may then be slight, not exceeding 5 to 15 per cent.

The highest assessments will be called for in cases presenting *neuralgic* or *paralytic* phenomena. Here—when operation is feasible—evaluation must be postponed until the results thereof are ascertainable. If inoperable and there be persistent neuralgia or paralysis, then it must be granted that the arm is functionally *hors de combat*. Accordingly our assessment in the case of the right or active arm may reach 70, in the left or passive 60 per cent. Naturally in cases in which the paralysis is less widespread the resultant incapacity may drop to 50, 40, and even lower.

Turning to Continental evaluations, German awards are distinctly generous. Thus if a fractured clavicle be associated with pain, wasting, and limited mobility of the shoulder, they rate the incapacity in the right at 30 to 50, in the left at 20 to 40 per cent., while we may add that the findings of the "Wiener Schema" range from 16 to 50 per cent. Nor do Continental authorities hesitate to go even higher, up to 75 per cent. when the functional capacity of the arm is wellnigh abolished. The French "Guide Barème des Invalidités" assesses as follows:

*Fractures of the Clavicle.*—(*a*) *Normal consolidation, slight muscular atrophy*, and *without scapulo-humeral periarthritis* in the *active* limb, 1 to 5 per cent.; in the passive, 1 to 2 per cent.

(*b*) *Normal consolidation* with *scapulo-humeral periarthritis*, in the active limb at 10 to 20 per cent.; in the passive, 5 to 10 cent.

10 *Dual Fractures of the Clavicle.*—(*a*) With *normal consolidation*, to 20 per cent.

(*b*) *Complicated by periarthritis*, 30 to 50 per cent.

*Vicious Union*

*Exuberant callus compressing one or more nerve trunks*, with (*a*) *Simple formication*—active, 30 per cent.; passive, 20 per cent.

(*b*) *Neuralgic phenomena* and *slight paresis*—active, 40 per cent.; passive, 30 per cent.

(*c*) *Extensive paralysis*—active, 60 per cent.; passive, 50 per cent.

*Pseudarthrosis*, if very marked, as in a case of Abderhalden, calls for assessment at from 40 to 50 per cent., but the milder varieties from 10 to 15 per cent., the French "Guide Barème" granting only 10 to 20 per cent. in the active, 5 to 10 per cent. in the passive limb.

## Fractures of the Scapula

Fractures of the *body* are often multiple. Union takes place frequently with overlapping or exuberant callus, but generally speaking good *functional* results ensue. Cotton states that in his ten cases the results were practically perfect.

Fracture of the *acromion* is rare. Union may be fibrous or bony, and in both the *functional* results are nearly always good.

Fracture of the *spine*.—The edge may be broken, or the mass of bone including the acromion may be separated. Some deformity, but no permanent disability results.

Fracture of the *glenoid* is rare, save as a complication of dislocation of the head of the humerus. Chipping of the edge may predispose to the recurrence of a dislocation.

Fracture of the *coracoid* rarely leaves any *functional* disability, for while union is seldom bony, no displacement results unless the coraco-clavicular ligaments are torn.

Fracture of the *neck*: bony union with some displacement is the rule, but in the majority of cases good *functional* results follow.

So much for fractures of the scapula as met with in *civil* life. But those due to *gunshot* wounds, by reason of their compound and comminuted character, are much more serious. They are

likely to be complicated by *infection*, with resultant *chronic osteomyelitis* and the formation of *sequestra*. Sequestral cavities hedged in by subperiosteal callus are frequently located at the angle and axillary border of the scapula in sequence to perforation thereof by a projectile. We have also to recollect the liability to concomitant infection of the *scapulo-humeral* joint and sequential total or partial *ankylosis*. This eventuality should constantly be borne in mind in treating such fractures, to the end of ensuring that the fixation if it occur shall be at as favourable an angle as possible. Unfortunately, too, in these cases the scapular muscles either suffer *direct loss of substance* or become the seat of a *progressive sclerosing myositis*—in which event the ultimate impairment of functional efficiency will be correspondingly aggravated.

### *Average Period of Incapacity*

French authorities lay stress on the frequency with which a *periarthritis* complicates fractures of the scapula, especially the *neck*. Mally holds that mild cases take six weeks, but pronounced types six to eight months to recover, albeit all eventually get well. On the other hand, how guarded our prognosis should be is exemplified by some cases recorded by Gallez, the duration of the incapacity in their instance ranging from seven to eighteen months. For ourselves, having regard to the salient element in periarthritis—viz. *subacromial bursitis*—we would place the period of incapacity from six to eighteen months.

Experience of *gunshot* fractures in this region is not yet ripe for dogmatic affirmations as to the average period of incapacity entailed. But it may be safely asserted that in the more severe cases the periods above cited will at any rate not be excessive and in all probability will be much prolonged.

### *Assessment*

Fractures of the *scapula* must be evaluated in the light of two possibilities: (1) immobilization of the scapula itself; (2) total or partial ankylosis of the shoulder joint. Given immobilization of the scapula and the scapulo-humeral joint, serious incapacity will ensue. But we have already, in the chapter on "Ankyloses," dealt in detail with the evaluation of the various eventualities that may ensue in this connexion—viz. ankylosis, total or partial, of the scapulo-humeral joint with or without immobilization of the scapula.

In the French "Guide Barème," in the evaluation of fracture of the surgical neck, spine, or body of the scapula, the degree to

which the mobility of the shoulder joint is compromised is taken as the basis thereof. (*Vide* Tables on Ankylosis.) The same authority in *pseudarthrosis* rates the disability at 50 and 40 per cent. in the right and left limbs respectively.

## Fractures of the Humerus

### *Upper Extremity*

This group includes fractures of (*a*) the *anatomical neck*; (*b*) the *surgical neck*; (*c*) the *tuberosities*; and (*d*) *separation of the epiphysis*. These fractures, while usually the result of direct, may yet be due to indirect violence, or, as in the case of the tuberosities, to muscular action. Fractures in this region are often *impacted* or *comminuted*, and, moreover, but too likely to be complicated by *dislocation* of the shoulder. Occasionally, too, neighbouring vessels or nerves—notably the *circumflex*—are involved.

Bland Sutton recently observed that he never saw a *compound comminuted* fracture of the head of the humerus until the present war supplied him with numerous examples. He remarks that the long tendon of the biceps is often spared by the bullet. In all his cases the fragments of bone were removed. He advocates, too, excision of the head when the shaft of the bone immediately below the head is extensively comminuted. In the early months of the war he removed the fragments of the shaft and left the head *in situ*, hoping that with the subsidence of the sepsis to make good the breach by grafting. But in practice this method of treatment proved unsound.

Apart from complications the *prognosis* in these intra- and juxta-articular fractures is o'ershadowed by (1) the difficulty of retaining the upper small fragment *in situ*; (2) the tendency to residual stiffness or limitation of mobility of the shoulder joint.

Thus fracture of the *anatomical neck* may be wholly *intra-articular*, hence the subsequent mobility of the joint may be seriously compromised. This especially if there be considerable displacement, not to be overcome by manipulation.

Similarly, in fractures of the *surgical neck*, it may be difficult to reduce and retain in coaptation the fragments. Even with good apposition there frequently ensues some *shortening* with *restriction of mobility*, notably in abduction and external rotation.

In fractures of the *tuberosities* union in a bad position is likely to be followed by diminished power of abduction. A separated epiphysis may unite readily—given good coaptation—otherwise

deformity and disability result. Still we have to take into account the fact that in the above class of fractures the *prognosis* differs according as to whether the newer operative methods have or have not been undertaken. We therefore append a table from the Fracture Committee's Report, summarizing the anatomical and functional results of *non-operative* and *immediate operative* treatment of fractures of the humerus:

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| | | | Per cent. | Per cent. |
| Anatomical neck | Non-operative . . | 5 | 80 | — |
| | Operative . . | 2 | 100 | — |
| Upper epiphysis | Non-operative, under 20 | 5 | 80 | 20 |
| | Operative, under 20 . | 2 | 100 | — |
| Tuberosity | Non-operative . . | 3 | 33 | — |
| | Non-operative, all ages | 37 | 40 | 17·5 |
| | Ditto, under 20 . . | 10 | 100 | — |
| Surgical neck | Operative, all ages . | 6 | 60 | — |
| | Ditto, under 20 . . | 2 | 100 | — |

Analysis of the above table clearly shows the superiority of *operative* as compared with non-operative methods. But inasmuch as the cases of fracture treated by the former are relatively few, it were unwise to dogmatize as to their greater excellence. Nevertheless, from the point of view of *evaluation* it is well to recollect that a good *functional* result is more likely to be attained when a good anatomical position has been secured.

### *Average Duration of Incapacity*

The time necessary for consolidation in cases devoid of complications and treated non-operatively varies from one to three to four months, the latter figure referring usually to cases of fracture of the *surgical neck*. In favourable instances of this latter, bony union results in about six weeks. If *periarthritis* complicate a fracture it will delay greatly the period of consolidation, six to eight months or more, and the same is true of cases complicated by *grave paralysis*. Imbert's summary is that the period of consolidation—save in isolated exceptions—oscillates between one to two months in favourable, and six to eight months in unfavourable cases. In subjects beyond middle age, Hennequin remarks that perfect functional recovery is not to be expected, and, if happily it does ensue, will not do so under

eight to twelve months. The following table is drawn from the Fracture Committee's Report:

*Average Duration of Incapacity*

| Age. | Site of Injury. | Non-operative. | Immediate operation. |
|---|---|---|---|
| Under 15 years | Anatomical neck and upper epiphysis | 8 weeks | No record |
| | Surgical neck and shaft . . . | 10·5 „ | 26 weeks |
| Over 15 years | Anatomical neck and upper epiphysis | 5·2 „ | 8 „ |
| | Surgical neck and shaft . . . | 27·6 „ | 32·8 „ |
| Permanent incapacity, over 15 yrs. | Anatomical neck and upper epiphysis | 20 per cent. | None |
| | Surgical neck and shaft . . . | 10 „ „ | 8 per cent. bad results |

## Factors in Evaluation

### *The Central Lesion*

The intra- or juxta-articular site of the fracture supplies the key to the problem. Is the *mobility of the shoulder joint* compromised, and if so to what extent? For *diminished mobility* is the salient consideration in evaluation, in that it postulates imperfect *functional* recovery.

At the same time it must be realized that in the scapulo-humeral joint—even if total ankylosis thereof follow fracture—such does not necessarily immobilize the arm. In other words, it is to some extent compensated by the *mobility of the scapula.* But even so, when one compares its range of movement with that of the opposite and unaffected side one quickly sees that the movements lack freedom and amplitude.

Again, in cases complicated by *periarthritis,* although the intra-articular surfaces are intact, still the periarticular thickenings and adhesions prohibit elevation of the arm beyond 45°. The *prognosis* from the point of view of functional recovery is unfortunately worse in *periarthritis* than in arthritis—particularly if it extend to the subacromial bursa. Such a periarthritis is more common in sequence to fracture of the *anatomical or surgical* neck of the humerus. The outlook will depend partly on the ætiology and perhaps more on the judgment displayed in treatment—viz. how far one is successful in hitting off the happy mean between too prolonged fixation and premature or too vigorous exercise.

### *Collateral Phenomena*

*Pain.*—This in some instances may of itself—by its severity and persistence—entail incapacity. Thus it is a prominent symptom of periarthritis, also of fractures complicated by dislocation with injury to the brachial plexus. The usual association therewith of other nervous phenomena will go far to substantiate its authenticity. But obviously regard must be had to the possibilities of *simulation* or *exaggeration.*

*Muscular Wasting.*—In fractures of the upper extremity this is often present and sometimes very pronounced. Occasionally *paralysis of the deltoid* develops through compression by or inclusion of the circumflex nerve in callus. In such event the prognosis will rest on the result of electrical testing. If the reaction of degeneration is evoked, it points to incurable paralysis, but otherwise recovery is usually certain and rapid. In rare instances *reflex atrophy,* due to a lesion of the anterior cornual cells, develops. In such cases electrical responses vary greatly, some being definitely those of degeneration, while in more favourable instances such is lacking and recovery ensues.

### *Assessment*

In proceeding to evaluate a case of fracture of the upper extremity of the humerus, the fundamental point to grasp is that, whatever be the nature of the particular lesion under review, it must be judged in light of its effect on the *functional efficiency* of the joint. Our first step then should be to ascertain whether *total* or *partial* ankylosis has ensued. If the former, the all-important question arises: Is the mobility of the *scapula* also lost or impaired? If not, so much the better, and then we may proceed to note the angle of fixation: *Is it favourable or unfavourable?*

If the arm be abducted, tilted slightly forward, and rotated inwards, it is in the best possible position for the limb, as its future movement depends on the action of the scapula. In such a case the resultant incapacity should be rated at from 25 to 30 per cent. This at any rate as a *physiological* evaluation, but if judged from the point of view of the subject's occupation —viz. *professional* evaluation—it would have to be raised possibly to 40 per cent. If with a *mobile* scapula the joint be ankylosed in an *unfavourable* position—i.e. *adduction*—our evaluation of the resultant incapacity must be raised to 40 or even 50 per cent. If the scapula be *immobile* and the angle of fixation of the shoulder be *favourable,* our assessment of the disablement should be

from 50 to 60 per cent. Lastly, if with *immobility* of the scapula the angle of fixation of the shoulder joint is also *unfavourable*, our figures should be raised to 65 per cent. or even higher.

Fortunately, cases of complete ankylosis are rare, and in the majority of instances it is a question merely of *residual stiffness* or *limitation of mobility*. Commonly, in such cases the arm can be elevated to 45° without movement of the scapula, but in evaluation we have to consider, not only diminished mobility, but also *pain* and *muscular atrophy*, especially the latter. Accepting 50 to 60 per cent. as our assessment in *total* ankylosis, it would appear equitable to rate the incapacity entailed by mere *limitation of mobility* at from 15 to 30 per cent., reserving the higher figure for cases marked by severe pain or muscular *atrophy*.

Fracture, if complicated by an unrecognized or unreduced *dislocation*, will of course call for higher compensation—up to 50 per cent. or more, and the same is true of cases complicated by *paralysis*.

The following are the rates of incapacity in ankylosis and limitation of mobility of the shoulder, as laid down by the French "Guide Barème."

| *Ankyloses* | Right. Per cent. | Left. Per cent. |
|---|---|---|
| (A) Total ankylosis with immobilization of scapula : | | |
| (*a*) Without complications . . . . | 50 | 40 |
| (*b*) With painful periarthritis . . . | 60 | 50 |
| (B) Ankylosis with mobility of scapula . . | 40 | 30 |
| *Limitation of Mobility* | | |
| (*a*) Retention of favourable arc of mobility, i.e. from the vertical to the horizontal plane forwards . . . . . | 10–20 | 10 |
| (*b*) Arc of mobility retained unfavourable . | 30–35 | 20 |

## Fractures of the Shaft of the Humerus

The commonest site of fracture in the shaft is just below the insertion of the deltoid. The injury may be caused by direct or indirect violence, or may simply be the result of muscular action. A by no means uncommon eventuality is *non-union* with formation of a false joint.

But the most striking and most frequent complication is involvement of the *musculo-spiral* nerve at the time of injury, but more often later through its gradual implication by callus or cicatricial tissue. The records of civil experience indicate that in fractures of the shaft musculo-spiral paralysis ensues in

from 4 to 8 per cent. of cases, being associated most frequently with fracture in the middle third of the shaft.

Turning to *military* statistics in this same region, we learn the following from Captain C. B. Alexander's analysis of the peripheral nerve lesions treated at Alder Hey Military Orthopædic Hospital, 1915–1917:

Of all the large nerves of the upper limb, the musculo-spiral was the one most commonly implicated in *gunshot fractures* or injuries to the humerus: "59 per cent. of all injuries of the musculo-spiral were associated with damage to the humerus." "Of all the main nerve trunks in the upper extremity" the musculo-spiral was least frequently associated with lesions of other nerves and most frequently with fracture. This led to the conclusion that the fracture, not the projectile, was in the majority of cases responsible for the injury."

Considerable *muscular atrophy* often follows fracture of the shaft of the humerus. This in gunshot fractures may be aggravated by the peculiarity noted by Broca—viz. that *atrophy* with *sclerosis* and *retraction* of certain muscles may ensue when the muscle itself has sustained but a slight injury, i.e. perforation by a bullet.

Fixation of the fracture is often a matter of considerable difficulty. The result is that movement is permitted between the fragments with, as a consequence, *non-union* or the formation of a false joint. Under these circumstances open operation with fixation will be called for.

In *gunshot* fractures *bone-grafting* may be necessary, owing to actual *loss of substance* in the long axis of the bone in sequence to chronic osteomyelitis.

We append some figures culled from the Fracture Committee's Report as to the anatomical and functional results attained in *fractures of the shaft* by operative as opposed to non-operative methods of treatment:

*Results of Non-operative and Immediate Operative Treatment of Fractures*

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| Shaft | Non-operative, all ages | 68 | 64·5 per cent. | 21·9 per cent. |
| | Ditto, under 15 | 18 | 61 „ „ | 22 „ „ |
| | Operative, all ages | 6 | 83·3 „ „ | — |

*Average Duration of Incapacity*

In *fracture of the shaft*, if good apposition can be secured, union results in four to six weeks, and according to Hennequin about thirty-five days.

*Functional recovery*, as opposed to bony union, is of course more tardy. According to Forgue and Jeanbrau, temporary incapacity for two and a half months must be expected. Austrian statistics based on 516 cases reveal an average of 103 days. Of course, if there are complications *functional* recovery will be retarded correspondingly. In *pseudarthrosis*, which may call for repeated operation, five to six months may elapse. The same is true of *paralyses*—the evolution of which, even though normal, may be tardy—involving six months or so. We append a table from the Fracture Committee's Report:

*Average Duration of Incapacity*

| Age. | Site of Injury. | Non-operative. | Immediate operation. |
|---|---|---|---|
| Under 15 years . . | Shaft | 10·5 weeks | No record |
| Over 15 years . . | Shaft | 27·6 weeks | 32·8 weeks |
| Permanent incapacity, over 15 years . . | Shaft | 10 per cent. | 8 per cent. ad results |

## Factors in Evaluation

*Central Lesion*

Given *sound union* in *good alinement* without complications, the working capacity should be little if at all impaired. But unfortunately this ideal is not always attained, and we therefore have to estimate the effect of departures therefrom.

*Shortening.*—This of itself as a rule causes no inconvenience. Even when it is the outcome of *union at an angle* it may not hamper the working capacity, unless it results in *torsion of the hand*, and here, too, it may not be as crippling as at first sight anticipated.

*Pseudarthrosis.*—This is relatively frequent, and though it may not diminish sensibly the extent or precision of the movements of the arm, it does necessarily render them more feeble or less vigorous. The functional disability is less marked when the pseudarthrosis is situate in the upper than in the lower third of the shaft. For the nearer its location to the *elbow* the

more likely is the range of movement in the latter to be interfered with mechanically by any fixation apparatus.

### *Collateral Phenomena*

*Articular Complications.*—Fractures of the shaft rarely lead to limitation of mobility in the *shoulder*—this at any rate in simple fractures. More commonly stiffness of the *wrist* and *fingers* ensues as the result of prolonged immobilization. When such has ensued in a middle-aged subject, a radiograph may reveal *arthritic changes* in the joints of the digits.

In *gunshot* fractures, stiffness of the shoulder may follow the prolonged immobilization entailed by the necessities of the wound. Apart from this, such may ensue through *infection*, occasionally spreading to the joint itself or to the periarticular tissues with resultant progressive sclerosis. But even in these cases the shoulder may be spared and the brunt of the disablement be occasioned by restriction in the range of movement of wrist and fingers.

*Musculo-spiral Paralysis.*—It is unnecessary here to dilate on the particular features of this lesion beyond stating that it compromises seriously the functions of the wrist and hand. Fortunately the prognosis is fairly good after suture or release of the nerve or both. Scudder and Paul's table of eleven examples treated by operation show eight cases of recovery of function—72·2 per cent.—the shortest interval in the successful cases between the accident and the operation being three weeks, and the longest three years.

### *Assessment*

In thoroughly consolidated fractures of the shaft—without shortening or complications—most authorities agree, ordinarily speaking, that no depreciation of industrial capacity results. Now to consider the assessment of cases less happily situated.

*Shortening.*—If of appreciable degree, sufficient to entail approximation of the points of attachment of related muscles with its associated depreciation of their *functional* efficiency, such must be taken into account. In extreme cases of this nature the French "Guide Barème" rates the resultant incapacity at 30 to 40 per cent.—an estimate which is by no means excessive. If of slighter degree but associated with more or less marked muscular atrophy it is rated at 10 to 20 per cent. in the active, and 5 to 10 per cent. in the passive limb.

*Vicious Union.*—The same authority in cases of *vicious callus* involving *torsion of the hand* either backwards or forwards

assesses the resultant disability, which may be relatively slight, at 10 per cent. in the active, 5 per cent. in the passive limb.

*Pseudarthrosis.*—Unfortunately this is relatively frequent and the functional capacity correspondingly diminished. Remy accords 50 per cent. in the right, and 40 per cent. in the left arm —an estimate held as too high by some, in view of the fact that the disability may be counteracted by a fixation apparatus. If the pseudarthrosis be located at the middle of the shaft, it is rated in the French "Guide Barème" at 40 per cent. (active) and 30 per cent. (passive), but if situate in the neighbourhood of the elbow joint at 50 per cent. (active), and 40 per cent. (passive limb).

*Musculo-spiral Paralysis.*—This obviously entails grave functional disability. Its gravity will differ according as to whether the person is right- or left-handed, and whether it affects the active or passive limb. But in any case the gravity of the complication dominates all other factors in evaluation. For its detailed consideration we would refer the reader to the chapter on "Nerve Injuries," and here we would content ourselves with saying that German jurisprudence rates it from 40 to 50 per cent., the latter estimate when the active member is involved. Remy accords 60 per cent. (right), 48 per cent. (left arm), while the French "Guide Barème" accords 60 per cent. and 50 per cent. respectively.

*Muscular Atrophy.*—Such, apart from musculo-spiral lesions, may be of high grade and entail great depreciation of functional efficiency. Remy in certain *reflex muscular atrophies* rates them in the right arm at from 5 to 30 per cent. Imbert in cases marked by moderate muscular atrophy with imperfect alinement assesses them at from 6 to 10 per cent. The same authority, quoting Austrian statistics, comprising 527 cases, gives the following figures:

| | | | |
|---|---|---|---|
| Without permanent incapacity | 237 cases | 44 | per cent. |
| With „ „ | 290 „ | 56 | „ |
| | 77 obtained | 10–20 | „ |
| | 72 „ | 20–33 | „ |
| | 69 „ | 33–50 | „ |

## Fractures in Region of Elbow Joint

Under this heading are comprised fractures located in (1) the lower extremity of humerus, and (2) at or near the upper extremities of the radius and ulna.

*Fractures of Lower Extremity of Humerus.*—These are alike difficult to diagnose and difficult to treat. In all instances

*radiographic* examination is imperative, not only to establish diagnosis, but later to ascertain if the fragments are in good position.

It may be useful here to indicate the main varieties of fracture in this region: (*a*) Supracondyloid; (*b*) fracture of the internal or external condyle; (*c*) T-shaped fracture; (*d*) separation of the lower epiphysis.

*Fractures of the Upper Extremities of Radius and Ulna.*—Either may be fractured alone, but frequently both simultaneously. Not infrequently also the injuries are very complex, attended by dislocation of one or both bones from the humerus or with in addition fracture of the latter.

*In the Region of the Elbow Joint*

*Results of Non-operative and Immediate Operative Treatment of Fractures*

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| | | | Per cent. | Per cent. |
| Supracondylar | Non-operative, all ages | 17 | 41·1 | 11·1 |
| | Ditto, under 15 | 8 | 75 | 12·5 |
| | Operative, under 15 | 1 | 100 | — |
| Lower epiphysis | Non-operative | 50 | 44 | 22 |
| | Operative | 14 | 57·1 | 7·1 |
| Internal condyle | Non-operative, all ages | 17 | 41·1 | 23·5 |
| | Ditto, under 15 | 11 | 72·7 | — |
| External condyle | Non-operative, under 25 | 7 | 14·2 | 42·8 |
| Radius, upper epiphysis | Ditto, under 15 | 2 | 50 | — |
| Ulna, olecranon | Non-operative, all ages | 20 | 45 | 30 |
| | Operative, all ages | 19 | 73·6 | 5·2 |

The *isolated* fractures to be met with in this group are fracture of (*a*) the olecranon; (*b*) the coronoid process; (*c*) the head of the radius; and (*d*) separation of the upper epiphysis of the radius. As in the former group, radiography is essential for diagnosis as well as for checking the results of reduction, especially if treated by non-operative methods.

Lastly, in fractures of all kinds in this region the difficulties of treatment—always sufficiently pronounced—are doubly so in *gunshot fractures*. This by reason of their comminuted nature, their liability to direct or secondary loss through necrosis, as well as the constant menace of concurrent infection of the joint and

damage to nerves and other structures. Again, the *functional* outlook in these cases is darkened by the fact that surgical or mechanical methods of reposition are, owing to the coincident sepsis, impracticable. Reduced therefore to conservative methods, there may be almost insuperable difficulties in immobilizing the parts so as to secure the fragments in good position, while permitting easy access to the wounds for the purpose of irrigation and dressing.

In *civil* life, however, operative methods have been invoked, and we append a table, drawn from the Fracture Committee's Report, illustrating the anatomical and functional results obtained by operative as opposed to non-operative methods of treatment. (See Table, p. 380.)

### *Average Period of Incapacity*

Complications being left on one side, it may be said that functional recovery in the majority of instances will ensue within three months, though sometimes the period of incapacity may be prolonged to six months. The following comparison of the average duration of incapacity in cases treated by non-operative methods as opposed to immediate operation may be of service:

*Average Duration of Incapacity*

| Age. | Site of Injury. | Non-operative. | Immediate operation. |
|---|---|---|---|
| Under 15 years . | Lower epiphysis and supracondylic | 13·5 weeks | 8·7 weeks |
| Over 15 years . . | „ „ „ „ | 17·1 „ | 78 „ |
| Permanent incapacity, over 15 years | „ „ „ „ | 17 per cent. | 6 per cent. |

## Factors in Evaluation

### *The Central Lesion*

In fractures in the region of the *elbow joint* obviously the degree to which the *mobility* of the same is compromised will constitute the dominant factor in evaluation. Now proceeding after a selective fashion, what are the types of disablement most likely to supervene in the train of these individual lesions?

In approaching this question it is well to recollect that owing

to the obliquity of the humero-ulnar joint the supinated forearm forms an angle with the upper arm, opening outward when the limb is extended to at or about 173° in males and 167° in females. This is known as the " carrying " angle, as in the above position the hand is held at some distance from the body, while the arm is in contact with the trunk.

Now interference with this " carrying " angle is likely to result in *functional* impairment of the joint. It is therefore well to remember that in *fracture of the internal condyle* its displacement upwards, by producing adduction of the forearm or cubitus varus, may alter the " carrying " angle.

To continue our analysis of the functional disabilities attaching possibly to other lesions. In *supracondyloid* fractures there is strong probability of ultimate limitation of movement by callus in the olecranon, coronoid, and radial fossæ. Again in *T-shaped* fractures there is grave likelihood of serious diminution of mobility in the elbow joint. *Ankylosis* may possibly ensue, but the minimum of subsequent disability will accrue if, after downward traction of the forearm, the elbow be bent in full flexion with the forearm fully supinated, i.e. palm towards the shoulder.

In *fractures of the upper extremity of the radius and ulna* we should recall that the synovial cavity of the elbow is continuous with that of the *superior radio-ulnar* joint. Hence, in addition to stiffness of the elbow joint proper, there is a possibility of serious diminution or even total loss of the power of *pronation* and *supination* of the forearm.

*Fracture of the Olecranon.*—If treated by splints *fibrous union* will probably occur with *deficient power of extension*—this even if the apposition of the fragments is good. In *non-union* or wide separation of the fragments operation affords the best prospect of a strong and useful joint. Lastly, fracture of the olecranon often involves the elbow joint, and if *compound* may result in *ankylosis.*

*Fracture of the Coronoid Process.*—If there be complete avulsion thereof relaxation and atrophy of the *brachialis anticus* may ensue or ankylosis of the elbow may follow.

*Fracture of the Head of the Radius.*—This is frequently associated with damage to the lower end of the humerus (fracture of the external condyle) and consequent involvement of the elbow joint. Little or no impairment of the movements thereof may follow, or, on the other hand, there may be more or less restriction. Excess of callus may call for *excision of the head of the radius* to increase the range of mobility of the joint.

*Collateral Phenomena*

*Muscular Wasting.*—This naturally is inevitable in *juxta-* or *intra*-articular injuries. In sequence therefore to fractures in this region marked atrophy of the muscles of the arm and forearm may ensue. The latter being responsible very largely for the movements of the hands and fingers, we should beware of overlooking its existence when present. Fortunately it is relatively rare, and usually the power of *flexion* of the elbow is alone impaired. In *gunshot* or compound fractures, the play of muscles and tendons may be hampered by adhesions to neighbouring structures, and in this way the movements of the hands and fingers compromised.

*Nerve Complications.*—In civil life these are met with more commonly in children than in adults. Not only may the *median* and *ulnar* be implicated, but also the *musculo-spiral* nerve. The effect of such combined lesions—if at all marked—is to produce *functional impotence of the hand.* Of individual nerve trunks the *musculo-spiral* and *median* are the ones most often injured, and this most frequently after *supracondylar* fractures. Injury to the *ulnar* nerve may follow fracture of the *internal condyle* or *olecranon.* It sometimes displays this peculiarity that the paralysis may be of very tardy onset, delayed sometimes years after the fracture occurred. (Broca and Mouchet, eighteen and twenty-two years !)

In *gunshot* fractures of the elbow, any of the foregoing may be involved, but most commonly the *musculo-spiral.* If the fracture involve the upper end of the radius, the *posterior interosseous* may be damaged with resultant drooping of the fingers. In more than one instance, too, we have seen paralysis of this trunk follow resection of the head of the radius.

In conclusion, it is worthy of note that the *prognosis* of gunshot fractures in this region is not so sombre as might be expected. As Romer has recently observed, of all fractures involving the joints, the "elbows give perhaps the most satisfactory results, and, provided supination and pronation remain unaltered, many men injured in this way have returned to full duty." Similarly, in these fractures we must—as they occur in civil life—not exaggerate their gravity. For happily consolidation often ensues with only trivial muscular wasting and slight limitation of movement, involving no permanent appreciable diminution of industrial capacity.

*Assessment*

As they come before us for evaluation, the cases readily fall into two categories—those marked by (1) complete ankylosis; and (2) incomplete ankylosis. We must therefore in rating the degree of incapacity in cases of *total* ankylosis note the angle of fixation, and in *incomplete* ankylosis the arc of mobility retained, whether favourable or not. Our assessments under these headings must also be reviewed in the light of whether the lesion is situate in the right or left arm. For the exact figures of evaluation we would refer the reader to the chapter on "Ankyloses." But here a brief digression is called for in respect of the assessment of fractures of the olecranon.

*Fractures of the Olecranon.*—In these, if attended by no *muscular atrophy and unimpaired power of extension*, Remy only accords 10 per cent. in right arm. But Imbert records a decision of the Riom Tribunal in which 51 per cent. was allotted, and discussing these findings suggests, as a mean, 20 per cent. as a measure of the incapacity entailed by a badly consolidated fracture of the olecranon. The French "Guide Barème" gives the following evaluations:

(*a*) Slight difficulty of extension and muscular atrophy: active, 10 per cent.; passive, 5 per cent.

(*b*) Fibrous union with limitation of extension: active, 20 per cent.; passive, 10 per cent.

(*c*) In cases of flail-like joint in the active, 50 per cent.; passive, 40 per cent.

*Persistent Nerve Paralyses.*—The following figures have been suggested: In the case of the *musculo-cutaneous*, Remy suggests, right, 50 per cent.; left arm, 40 per cent. The same authority evaluates paralysis of the *median* at 40 per cent., but German jurisprudence allots 50 per cent. and even 75 per cent. For the radial (musculo-spiral) Imbert suggests 50 to 60 per cent., and agrees with Thiem that in the *ulnar* nerve 50 to 55 per cent. is equitable.

## Fractures of the Shafts of the Radius and Ulna

The shaft of either the radius or ulna may be fractured, but more commonly both bones are broken together. The radius is usually fractured by direct, the ulna by indirect violence. If in fracture of the radius alone the lesion be situated above the insertion of the *pronator radii teres*, care must be taken that the forearm after reduction of the fracture be put up in a position of full supination with the elbow flexed to a right angle. For if the forearm be put up with the hand midway between the prone

and the supine position, the subjects usually recover with *great loss in the power of supination.*

*Results of Non-operative and Immediate Operative Treatment of Fracture of Radius and Ulna*

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical and functional. |
|---|---|---|---|---|
| | | | Per cent. | Per cent. |
| Radius, shaft | Non-operative, all ages | 45 | 53·1 | 12·7 |
| | Ditto, under 15 | 19 | 73·6 | 10·5 |
| | Operative, all ages | 7 | 57·1 | 14·2 |
| | Ditto, under 15 | 4 | 75 | 25 |
| Ulna, shaft | Non-operative, all ages | 18 | 77·7 | 11·1 |
| | Ditto, under 15 | 10 | 80 | 10 |
| | Operative | 1 | result not good | — |
| Radius and ulna | Non-operative, all ages | 2 | 38 | 17·1 |
| | Ditto, under 15 | 76 | 63 | — |
| | Operative, all ages | 55 | 75 | — |
| | Ditto, under 15 | 3 | 100 | — |

*Average Duration of Incapacity*

Bony union is usually complete in about four weeks, but functional recovery, even in cases without any compensation, will not be achieved under three months. Forgue and Jeanbrau admit an average delay of two and a half months. One authority cited by Gallez—viz. Hänel—on the basis of six or seven cases, places the average duration of incapacity in a third of his series at six months, and in the residue at seven months. This prolonged period would appear to indicate the presence of complications such as *pseudarthrosis* or *Volkmann's contracture,* in which doubtless the period of incapacity would be prolonged to this extent. Reference to the accompanying table will be of value in gauging the *results of non-operative and immediate operative treatment of fractures of radius and ulna.*

*Average Duration of Incapacity*

| Age. | Site of Injury. | Non-operative. | Immediate operative. |
|---|---|---|---|
| Under 15 years | Radius and ulna | 17·1 weeks | 6 weeks |
| Over 15 years | „ „ „ | 20·6 „ | 19·4 „ |
| Permanent incapacity, over 15 years | „ „ „ (including lower epiphysis) | 6 per cent. | 8 per cent. |

## Factors in Evaluation

### *Central Lesion*

In most limb segments the skeletal structures lying intermediate between two joints must possess one quality and one only—viz. *solidity*. But the bones of the forearm present this particular feature, that the functional integrity of this segment demands, not only solidity, but also that the two bones—the radius and ulna—be *movable one upon the other*: this to permit of the execution of the important movements of *pronation* and *supination*. These brief remarks may form a fitting prelude to the individual elements that prejudice or not the ultimate functional efficiency of the limb.

*Shortening.*—When *both* bones are broken and the fractures are oblique, shortening may be produced by the combined action of the flexors and extensors. Obviously it cannot occur when only *one* bone is fractured. Given fracture of both bones, with marked shortening, the muscular vigour of the forearm may be diminished through approximation of the points of attachment of the muscles.

*Vicious Union.*—If the fracture be located above the insertion of the pronator radii teres, the following source of permanent incapacity may ensue. The two chief *supinators*—the biceps and supinator brevis—being attached to the *upper* fragment, and the two chief *pronators*—the pronator radii teres and the pronator quadratus—to the *lower* fragment, the following malposition ensues: the upper fragment tends to become fully *supinated* and the lower fully *pronated*. A condition of true vicious union is established when—in fracture of one bone—the fragments fuse with the neighbouring intact bone. Or the same result is achieved if when both bones are fractured a similar coalescence occurs. In either instance the resultant incapacity is very marked. For the movements of torsion are wholly abolished and the forearm remains immutably fixed in one position.

*Pseudarthrosis.*—In fractures of the forearm non-union occasionally results in a false joint being formed—due probably to the fact that, the elbow being imperfectly fixed, slight movements of this joint and also of pronation and supination were permissible.

*Double pseudarthrosis*, according to Rieffel, entails a condition of absolute impotence, but Imbert on this point remarks that pseudarthrosis limited to *one* bone cannot be regarded in all cases as equivalent to loss of the functions of the limb. Even a double pseudarthrosis, he says, may not totally incapacitate the

subject for work. The movements of the hand and digits are retained and lack nothing in precision, though the vigour of such is impugned. Work requiring strength may be impossible, but delicate handiwork may still be compassed—this the more so if, as is often the case, a fixation apparatus diminishes the undue mobility.

In regard of Imbert's dicta on these points we cannot agree, and we would refer the reader for our discussion of this question to the previous chapter on "The Principles of Evaluation in Fractures." Lastly, in all forms of pseudarthrosis the amenability of such to fixation by operation must always be taken into consideration. For the results thereof, if successful, will materially alter our assessment of the measure of the residual incapacity entailed by such a lesion.

### *Collateral Phenomena*

*Muscular Atrophy.*—This is usually obvious enough, but it may be more or less masked by coincident *œdema*. It is more likely to be of high grade in fractures due to direct violence —gunshot wounds. A reinforcing factor may be coincident damage of the nerves responsible for their innervation. *Paralysis* may therefore ensue, which otherwise is exceptional in these fractures as they occur in civil life.

*Volkmann's Ischæmic Contracture.*—This curious condition is practically one peculiar to the lower arm. The flexor muscles and their tendons undergo retraction, but those inserted into the thumb are only implicated to a lesser extent. Clinically it is characterized by flexion of the fingers into the palm, and is usually ascribed to errors of technique, e.g. constriction by bandages. (*Vide* chapter xxii.)

### *Assessment*

Given *good alinement* and *sound union*, with retention of the movements of torsion, and little or no muscular atrophy, a fracture of the forearm may entail no permanent incapacity. If *vicious union* be present, our evaluation will depend on the limitation of movement entailed by such irregular coalescence of the bones. From a practical point of view there now arises the following question: *Is the power of torsion of the forearm wholly or partially lost?*

Now, in attempting to evaluate we must recall that the functional capacity of the forearm and, above all, of the hand is intimately bound up with these particular movements. Many

of our daily actions—eating, drinking, writing, doing our hair, etc. —are hampered greatly if there be any mechanical obstacle to the rotation of radius on the ulna. Of the two movements *supination* is the more powerful. It is for this reason that the tools of workmen are so made that tool-driving, gimlet-turning, and other mechanical work of this nature is achieved by supination of the forearm.

Accordingly, a man whose forearm is immobilized in *supination* is more handicapped than if fixation had supervened in pronation. We would suggest therefore that—given *fixation in supination*—the resultant incapacity should be rated at 40 in the left, and 50 per cent. in the right. Given *fixation in pronation* the resultant incapacity should be rated in the right at 40, in the left at 30 per cent.

But the rotation movements of the forearm may not be wholly, but only *partially* lost. In other words, if the injured person is put before a table of ordinary height and one order him to place his hand and forearm on the table in complete pronation, he usually can do so without great difficulty. Then bid him supinate his hand, carefully noting whether the rotation takes place in the forearm or at the *level of the shoulder*. Normally the forearm is capable of rotating through a half-circle, and in this way its dorsal surface can be applied to the table. But often this movement can be compassed only in part—viz. the forearm only traverses a quarter of the circle and stands, so to speak, perpendicular to the table. In the same way one can ascertain how far the power of *pronation* is lost.

Accepting therefore as our *mean position the one in which the forearm is perpendicular to the table*, it will be readily realized that the *retention of movement in the direction of pronation* is much more favourable than its conservation in the direction of supination. Remy therefore in the latter admits an incapacity of 15 to 30 per cent.; in the former of 10 per cent. in the right arm. Still even higher figures are admitted: the "Wiener Schema" estimates ranging from 16 to 41 per cent.—viz. according to the degree of ankylosis. The French "Guide Barème," when dealing with fractures of the *mid-shaft of both bones*, observes that the most frequent consequence of such a lesion is limitation or abolition of the movements of rotation.

| | Active Per cent. | Passive Per cent. |
|---|---|---|
| 1. Limitation of rotation with *retention of pronation* . | 10 .. | 5 |
| 2. „ „ „ „ supination . | 20–30 .. | 10–20 |
| 3. Total loss of rotation with immobilization in pronation | 40 .. | 30 |
| 4. „ „ „ „ „ supination | 50 .. | 40 |

*Pseudarthrosis.*—This infirmity is sensibly less disabling, nevertheless Remy rates a *double pseudarthrosis*, right, 50 per cent.; left, at 40 per cent.—an estimate which Imbert considers somewhat high for the generality of cases. For it must be realized that by a fixation apparatus the condition may be ameliorated, when the estimate will be correspondingly lowered, and he suggests should range from 30 to 40 per cent.

The French "Guide Barème" in instances of *double pseudarthrosis* (where such is capable of correction by the wearing of a prosthetic appliance) rates the disability in the *active* limb at 30 per cent., if not, at 40 per cent.; in the *passive* limb at 20 and 30 per cent. respectively. Where only *one* bone is the seat of a false joint the rates of assessment for similar disabilities laid down by the above authority are in the *active* limb 10 and 20 per cent.; in the *passive* 10 and 15 per cent. respectively.

*Volkmann's Ischæmic Contracture.*—Up to the present this condition has been little studied from the point of view of its bearing on industrial capacity. To avoid repetition we would refer the reader to chapter xxii, where this question is more fully discussed.

## Fractures in Neighbourhood of Wrist Joint

Under this heading are included (*a*) Colles's fracture; (*b*) fracture of the styloid process of the ulna; (*c*) separation of the lower epiphysis of the radius. There is a type in which the features of Colles's fracture are reversed (Smith's fracture), usually due to forcible flexion through a fall on the back of the hand. Here, also, we may mention the well-known *chauffeur's fracture*, i.e. of lower end of radius—usually occasioned by the recoil of the crank in starting a motor-engine, as the result of which the handle comes into violent contact with the forearm. These fractures derive importance owing to the frequency with which they are complicated by *stiffness*, not only of the *wrist joint*, but of the *fingers*.

Unfortunately not a few of the functional disabilities that follow fractures of the wrist are referable to errors of technique. Speaking of *gunshot fractures* in this region Sir Robert Jones observes: "I have seen several cases of gunshot wounds to the wrist and they have been mostly treated with the hand in line of the forearm—that is, midway between palmar and dorsi flexion." The proper position in which to maintain the wrist is that of *dorsi-flexion*, as in this way the vigour of the grip of the hand and fingers is maintained.

*Result of Non-operative and Immediate Operative Treatment of Fractures of Radius and Ulna*

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| | | | Per cent. | Per cent. |
| Radius, lower epiphysis | Non-operative, all ages | 15 | 66·6 | 13·3 |
| | Ditto, under 15 | 11 | 63·6 | 9 |
| | Operative, under 10 | 1 | 100 | — |
| Colles's | Non-operative, all ages | 47 | 27·6 | 29·7 |
| | Ditto, under 15 | 4 | 100 | — |
| | Operative | 1 | 100 | — |
| Ulna, lower epiphysis | Non-operative | 3 | 100 | — |

*Average Duration of Incapacity*

| Age. | Site of Injury. | Non-operative. | Immediate operative. |
|---|---|---|---|
| Under 15 years | Colles's fracture | 3·7 weeks | No record |
| Over 15 years | Ditto | 17·1 „ | — |
| Permanent incapacity over 15 years | Ditto | 14·7 per cent. | — |

## Factors in Evaluation

### *The Central Lesion*

In Colles's fracture *complete reduction* is of the greatest importance for the future *functional* utility of the forearm. Fortunately, notwithstanding the great frequency with which permanent deformity is met with, the same is not necessarily incompatible with a functionally useful wrist. Happily, too, limitation of supination and pronation is not common, but if through vicious union it ensue, permanent disability will follow unless operative measures are resorted to. The *ultimate functional results* will depend upon the response to refracture with Thomas's wrench and subsequent reduction. When this fails open operation is unavoidable. Indeed the operative treatment of Colles's fracture is restricted to correction at a late period of the evil consequences of imperfect reduction.

*Collateral Phenomena*

The *functional end-results* of fractures vary according to their influence, if any, on the mobility of the neighbouring articulations. Now, although in Colles's fracture the *radiocarpal* is the only joint directly involved, its evil effects are not confined thereto. For often, though indirectly, the mobility of the *metacarpal* and *phalangeal* joints—let alone the small articulations of the carpus itself—are simultaneously implicated. This because the sheaths of the tendons responsible for movements of the digits often become involved in the inflammatory reaction at the site of the fracture. Hence it happens that the fingers are frequently immobilized or can only be moved feebly—an untoward result that may accrue even though the articulations themselves are intact.

Here it may be remarked that the *flexor* are more often implicated than the extensor tendons. This is unfortunate, as *extension* of the digits is merely a prelude to their energetic flexion, thanks to which the workman is able to grasp his tools with greater vigour.

The troubles, however, that may follow fracture in this region are still not exhausted. Even though the fracture may have been simple and completely reduced, yet if the subject be aged or prone to *rheumatic* manifestations, it is but too likely that a *plastic synovitis* or *perisynovitis* may ensue. Coincidently much swelling and cellular infiltration develop, while the tendons are hampered by *adhesions* which lead to more or less marked pain on movement. Nor is *wasting* of muscles of the forearm long in making its appearance, and hence the movements of the wrists and fingers become not only stiff but feeble. Ultimately a condition reminiscent of *osteoarthritis* may ensue, but this untoward eventuality is relatively rare.

*Nervous Troubles.*—These are exceptional, but occasionally compression of the median, radial, or ulnar nerve by displaced fragments with resulting neuritis and paralysis is met with.

*Assessment*

Nothing is more erratic than the assessments of the incapacity entailed in Colles's fracture. Often the hand recovers its function entirely, or with such slight impairment that the working capacity can hardly be held depreciated.

The salient factor is the *mobility* of the *radiocarpal* and *digital* joints. If the wrist joint be *ankylosed*, is it fixed in *extension* or *flexion*? If the latter, the functional efficiency of the joint

will be impaired in direct ratio to the degree of flexion. Given *flexion* more or less acute, the power of gripping will be seriously minimized. On the other hand, the nearer the angle of fixation approaches to full extension the greater the degree of *functional efficiency* retained. For our own figures of evaluation in ankyloses of this joint we would refer the reader to the chapter thereon. But by reason of their intrinsic interest we would here interpolate the figures cited by the French "Guide Barème" in ankylosis, whether total or partial, of the wrist joint:

*Ankylosis*

| | Active Per cent. | Passive Per cent. |
|---|---|---|
| (*a*) With wrist in extension or in a line with forearm . . | 20 .. | 10 |
| (*b*) „ „ flexion . . . . . | 40 .. | 30 |
| (*c*) „ „ pronation . . . . . | 40 .. | 30 |
| (*d*) „ „ supination . . . . . | 50 .. | 40 |

Of individual estimates in total ankylosis, Brouardel's figures oscillate between 5 and 45 per cent. The Austrian scale ranges from 15 to 20 per cent.; those of German jurisprudence up to 40 per cent., while those of the French tribunals, according to Ollive and Le Meignen, oscillate between 20 and 60 per cent. Imbert regards the latter figure as excessive, even when the wrist is in a bad position. He, for the left hand, suggests a minimum of 5 to 10 per cent. in persons not engaged in delicate handiwork; and a maximum of 35 to 40 per cent. for those engaged in highly specialized trades.

*Limitation of Mobility*

As Léon Imbert (whose evaluations have been adopted by the French Ministry of War in regard to these lesions) observes: "It is necessary if we would appraise equitably limitations of mobility that we familiarize ourselves with the normal range of movements in this articulation."

| | Degrees |
|---|---|
| (*a*) Movements of flexion and extension vary between . | 95–130 |
| (*b*) „ „ adduction . . . . . | 50 |
| (*c*) „ „ abduction . . . . . | 32 |
| (*d*) „ „ pronation and supination, a total angle of | 180 |

The above authority remarks that limitations of flexion and extension, as also of adduction and abduction, do not in many occupations constitute a grave obstacle to their pursuit.

(*a*) If the arc of movement retained, though limited, extend equally on both sides of the vertical, it is held as favourable: active, 8 per cent.; passive, 5 per cent.

(*b*) If the arc of movement is only in the direction of exaggerated flexion, i.e. extension is impossible, the angle is *unfavourable* (Remy): active, 15 to 20 per cent.; passive, 10 to 20 per cent.

The movements of *pronation* and *supination* are more important for the functional efficiency of the hand. Also the retention of the power of movement in the direction of pronation is much more favourable than in that of supination.

(*a*) If the arc of movement retained be favourable for the furtherance of *pronation*: active, 10 per cent.; passive, 8 per cent.

(*b*) If the reverse, i.e. favours supination, it is held unfavourable: active, 20 to 30 per cent.; passive, 10 to 20 per cent.

Of *individual* opinions, Greer in our own country considers that *partial ankylosis* does not interfere with the working capacity except in specially skilled trades. This particularly if extension be not interfered with. If, however, this movement be impossible, it greatly aggravates the disability. In such cases Remy allots 15 to 30 per cent. (right), 12 to 24 per cent. (left).

Brouardel's figures range from 0 to 30 per cent. according to the degree of incapacity entailed in the various professions.

*Paralysis of the Nerves of the Hands.*—These are naturally less grave than when the lesion is situated in the arm or forearm. Remy evaluates them at 10 to 12 per cent., and Imbert's estimates vary from 8 to 20 per cent.

## Fractures of the Carpus

These injuries were formerly held exceedingly rare, but since it has been the custom to skiagraph systematically the wrist joint in bad sprains, it has transpired that fracture of one of the carpal bones is by no means uncommon. The one most usually fractured is the *scaphoid*, and unless efficiently treated it is liable to be followed by pain and stiffness in the *wrist joint*. Fracture of the *scaphoid* may complicate Colles's fracture or may be associated with dislocation of the semilunar, and is usually caused by a fall on the outstretched hand.

### Factors in Evaluation

Objectively injuries to the carpus are marked by a *retraction of the wrist*, i.e. the hand is drawn nearer to the bones of the forearm. This retraction, unless very marked, has no important functional result.

The most serious lesion, however, is *luxation of the two bones* (luxation backwards of the os magnum, and forwards of the semilunar). This lesion is marked by widening of the antero-

posterior diameter of the wrist. It leads to serious disability —viz. *immobilization of the wrist, hand, and fingers.* In general the fingers are semi-flexed, either all their movements are annulled or at best very feeble, so that the subject can neither bring them into contact with the palm nor extend them. As for the wrist, the movements of pronation and supination are sometimes free but sometimes abolished, while those of adduction and abduction are interfered with.

To sum up, there results from this lesion a type of *ankylosis* which compromises gravely the functions of the hand. Moreover, even in less marked cases there often results pronounced *wasting of the muscles of the forearm and rarefactive osteitis.* Nor is this all, for in 125 instances, Delbet in forty-one noted *compression of the nerves,* almost exclusively the *median,* with resulting *incomplete paralysis.* But as a rule the *sensory* functions are more impaired than the motor.

The *prognosis* is none too good, at any rate, in cases not subjected to operation. Delbet in forty cases noted that in twenty-seven the results were definitely bad. But doubtless they would improve if surgical intervention were resorted to more commonly.

*Assessment*

Simple fracture of the *scaphoid,* in the majority of instances, occasions no permanent incapacity. This latter, however, may supervene if *muscular atrophy* or *persistent pain* be present, and rarefactive osteitis, if well marked, may be a factor.

In estimating the effects of *luxation* of the *os magnum* and *semilunar,* the salient point is how far are the functions of the hand affected. In the worst type of case—immobilization of hand with fingers in flexion (Delbet)—a high degree of incapacity may result, justifying 40 per cent. or even more. But generally speaking the average case would be adjudged at from 15 to 25 per cent. In cases of *fracture* or *dislocation* of the carpus the French "Guide Barème" deems the resultant disability as identical with that following ankylosis, total or partial, of the wrist and fingers, and we would refer the reader to the tables on ankylosis (chapter xiii) for the rates of assessment laid down by this authority. In pseudarthrosis of the wrist in the French "Guide Barème" the incapacity in the active is assessed at 20, in the passive limb at 10 per cent.

## Fractures of the Metacarpal Bones

These are not uncommon, the second, third, and fourth metacarpals being those most frequently broken. The most

common cause is either a blow or a crush, but it may be indirect through a fall on the hand. Lenoir has noted the frequency with which fracture of the lower end of the *first metacarpal* occurs in boxers. The chief danger is that an *excess of callus*, very frequent in *gunshot* wounds of this region may displace the extensor tendons or produce adhesions in the tendon sheaths.*

### Factors in Evaluation

The principal factor is how far the *movements of the fingers* are compromised. Fortunately, if interfered with, they are not so to a great extent, and usually it is only the related *metacarpo-phalangeal* joint that is affected. Albeit it is necessary to recollect that sometimes other articulations in the same finger or even of the neighbouring digits may undergo limitation of their mobility. Such interference of mobility is more apt to occur in *compound* fractures, especially if the seat of prolonged suppuration. Very commonly in these cases the resulting articular stiffness is due to inclusion of the related *extensor* tendons in the callus.

*Muscular atrophy* is frequent enough, but is difficult to appreciate. It may affect the thenar or hypothenar eminences, or its brunt may fall upon the interosseous muscles or the lumbricales. According to Golebiewski it is in fractures of the *third metacarpal* that the functions of the hand are most affected. It is well to emphasize the need of X-ray examination in these cases, as but too frequently the diagnosis of fracture is retrospective—tardily undertaken to explain the otherwise inexplicable pain and weakness complained of by the subject.

* "Index of Prognosis."—Metacarpals: *Fracture of the First Metacarpal.*—This may occur at the distal end of the shaft or at the base. If good alinement can be achieved and maintained in these, a good result may be expected.

*Fracture at the Base* (Bennett's Fracture).—An oblique fracture through the base. Good anatomical reposition is not always achieved, but very fair functional results may follow. Lambotte has had a good result by fixing the fragment into position with a fine screw.

*Separation of the Basal Epiphysis* of the first metacarpal occasionally occurs. In the two cases recorded by Coues a good result followed.

*Fractures of the Shafts* of the other metacarpals are apt to give serious trouble if a good alinement cannot be achieved; if this is obtained and maintained, the results are good. In difficult cases, oblique fractures and such-like, Lambotte recommends a small form of fixateur or a small plate, or cerclage, as giving good results.

*Fractures of the Heads* (Knuckle Fracture; Pugilist's Fracture).—According to Cotton some deformity always remains, flexion may be impaired, function generally is good. He quotes a case in which there were sixteen of these fractures in both right and left hands, without serious loss of function occurring, except in one knuckle.

*Assessment*

As before said, the question of the incapacity entailed rests on the degree to which movement of the digital joints is compromised. Austrian statistics compiled from 352 cases of fracture of the metacarpals reveal that 200 recovered in less than six months without permanent incapacity, the average duration of the cure being forty-four days. In 152 cases consolidation was only effected at the expense of a permanent incapacity carrying from 10 to 20 per cent.

The French "Guide Barème," in regard to fractures of the metacarpal bone, holds that the incapacity is in no way diminished, but if it exist it should be assessed in the active at 5 to 15 per cent., in the passive limb at 0 to 5 per cent.

## Fractures of the Phalanges

These small bones are not infrequently fractured and usually by *direct* violence. Compared with the metacarpals the movements of the related joints are less likely to be compromised in fracture of the phalanges. Frequently, however, owing to overlapping of the fragments, the flexor and extensor tendons are hampered in their action and stiffness results. *Ankylosis*, too, may follow in a straight or flexed position, when there will be interference in the full power of the hand and *amputation* may be necessary to restore function.

The same factors in evaluation will hold good as in the case of the metacarpals, and we would refer the reader to the chapter on "Ankyloses."

Bogatsch, cited by Kaufmann, quotes statistics regarding fifty-two cases of fractured phalanges, of which twenty-four obtained no indemnity, the remainder being compensated.

The French "Guide Barème" goes into meticulous detail when evaluating *pseudarthrosis* of the digits.

*Active Limb.*—Pseudarthrosis of the *ungual phalanx* is assessed in the thumb at 5 per cent., in the index at 4 per cent., and in the remaining fingers at 2 per cent. If the pseudarthrosis be situated in other phalanges they are rated in the thumb at 15 per cent., in the index at 10 per cent., and in the remaining fingers at 5 per cent.

*Passive Limb.*—Pseudarthrosis of the *ungual phalanx* is assessed in the thumb at 3 per cent., in the index at 2 per cent., and in the other digits at 1 per cent. If situate in other phalanges it is evaluated in the thumb at 10 per cent., in the index at 8 per cent., and in the other digits at 3 per cent.

## PERIODS OF ADAPTATION AS DETERMINED BY THE GERMAN IMPERIAL INSURANCE OFFICE

### Fractures of Upper Limb

*Fracture of the Clavicle.*—Given sound union and good alinc-ment, with no interference with the *mobility of shoulder*, the period of adaptation is from two to four years. Even when fracture of the clavicle is associated with *impaired functional efficiency of the shoulder*, adaptation sufficient to justify reduction of annuity has in many cases ensued.

With regard to fracture of the *arm* the information supplied is very scanty. The authorities content themselves with the statement that fractures of the arm, when well united, leave little play for adaptation, complete recovery usually resulting. When, however, the *mobility of the shoulder joint* is compromised it is far otherwise. Thus given slight limitation of the mobility of the shoulder, adaptation was achieved in from one to three years, with resultant abolition of annuity. In other instances, the subject failing to accommodate himself wholly to the disability, the annuity was continued though diminished.

The authorities, broadly speaking, observe that in *fracture of the right elbow* with residual slight limitation of flexion, only to a minimal degree compromising industrial capacity, the disability after a period of three years is nullified by adaptation. They cite the case of a labourer—the subject of fracture of right elbow with limitation of flexion to 20°. Adaptation was admitted to by the victim after three years.

They also lay stress on the following fact—viz. that although a certain limitation in the right elbow may persist, the accomplish-ment of adaptation may be assumed, if the *circumference of the right arm exceeds that of the left.* This difference—even if it only reach 1 cm.—does, they claim, demonstrate that the limb is used after a normal fashion. In several cases annuities have been lowered according to the measure to which accommodation to the consequences of the disability has been achieved.

It is but fair to add, however, that they are fully alive to the fact that prolonged disablement may follow fractures of the elbow. They cite the instance of a valet who sustained a *fracture of the right elbow*, which entailed the following residual disabilities—slight limitation of supination, with retention of flexion to 90° and of extension up to 150°. Adaptation took seven years to realize.

Another example with the following features is recorded:

*Fracture of Right Olecranon.*—Permanent separation of fragments to the extent of 1½ cm. Perfect mobility of elbow. Wasting of muscles, but no functional impairment. Adaptation after twenty years!

*Fractures of Forearm.*—On an average the periods required for adaptation are notably shorter than for simple *loss of the fingers.* This even when the former lesion is followed by stiffness of the *wrist.* They cite the following cases:

(1) *Fracture of Right Radius.*—Union with slight deformity. Adaptation in the case of a locksmith was realized in two and a half years; in a labourer in one and a half years.

(2) *Typical Fracture of Right Radius and Ulna.*—Slight deviation of hand towards radial and dorsal surface. Range of abduction limited to one-third of usual arc. Muscles of arm normal. Thick callosities in both hands. Complete adaptation in the victim, an agricultural labourer, in four years.

(3) *Fracture of Right Radius.*—Sound union. Hand slightly deviated radially and dorsalwards. Mobility of wrist in flexion and extension restricted to a quarter of the normal range. Musculature of arm normal. Complete adaptation ensued in the subject, a waiter, after thirteen weeks.

The authorities declare that persistent limitation of flexion of the wrist, though it slightly hampers the use of the hand, does not entail a diminution of the industrial capacity nor an inferiority in the labour market. In regard to the *left forearm* the Imperial Office submit that union of fractures thereof, despite slight *deviation of the hand,* in no way diminishes the working powers, once adaptation thereto is realized. The periods required for the same vary from thirteen weeks to one and a half, two, three, five, or twelve years for fractures of the radius with slight *limitation of the movements* of the wrist.

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# CHAPTER XVII

# FRACTURES OF THE LOWER LIMB

## Fractures of the Pelvis

Most British authorities agree that fractures of the pelvis are not common. Imbert, the French expert, on the other hand, holds that they are not rare as the result of "industrial accident." Their relative frequency as a *casualty of war* has not as yet, to our knowledge, been ascertained.

As a general rule they are the outcome of *severe* and *direct* violence, e.g. a fall from a height, the passage of a cart-wheel over the body, a crush between railway trucks or beneath the falls of debris, etc.

Only very rarely are they produced through indirect violence sustained by the great trochanter, knee, or foot.

The gravity of pelvic fractures consists essentially in the probability of *associated lesions in the pelvic viscera*, i.e. the membranous urethra, the bladder, vagina, rectum, or large vessels. These serious complications, if not confined to, are infinitely more common in, fractures involving the *brim of the true pelvis*. But even in the more favourable instances, if deformity ensue, the remote consequences may be serious, e.g. obstructed pelvic outlet in women, with its correlated impediment to parturition.

But, as said before, the gravity of pelvic fractures is determined by the nature of the visceral lesions. How grave may be gathered from a table of fifty-four cases recorded by Paul, in which the mortality reached the high figure of 50 per cent. Laparotomy was called for in five instances—in four for ruptured bladder and rectum, and all succumbed. In four others of the series, external urethrotomy was necessary, and of these only two survived.

### *Varieties of Pelvic Fracture*

These are divisible into (*a*) fractures involving a breach of continuity of the pelvic brim at one or more points; (*b*) localized fractures, implicating (1) the ilium above the pelvic brim, (2) the ischium, (3) the acetabulum, (4) the sacrum, (5) the coccyx.

The gravity of (*a*) is greater in regard to both its immediate and remote consequences. This by reason of the probable involvement of pelvic viscera, and often death from shock or complications, and later through its *static* effects—viz. interference with the maintenance of the erect posture and transmission of body-weight.

Fractures of the *ilium*, though the most common, are the least serious—a portion of the crest or the anterior superior iliac spine being alone involved. Fracture of the *ischium* is very rare and its prognosis favourable. Fracture of the *acetabulum*, if it involve the floor thereof, is of graver import in that the pelvic viscera may be involved. The latter may be associated with *dislocation of the hip.*

Fracture of the *sacrum* is usually transverse, and the lower fragment being displaced forwards may encroach on the rectum and obstruct the passage of fæces. Indeed, the bowel may actually be torn, and, the sacral nerves being implicated, paralysis of the legs, retention of the urine, and incontinence of fæces may ensue.

Fracture of the *coccyx*, like that of the sacrum, may result in pain on defæcation or in maintaining the sitting posture.

### Factors in Evaluation

*Fractures of the Pelvic Brim.*—The gravity of these is frequently dominated by the associated lesions of the urethra and bladder. These when present must be taken into consideration in attempting their evaluation, but for the assessment of these urinary complications we would refer the reader to our second volume.

Here we purpose dealing, as it were, with the degrees of incapacity produced by pelvic fractures of more or less *uncomplicated* type. Assuming that, after a simple or multiple fracture of the pelvic brim, recovery takes place, what are the sequels which most commonly prejudice industrial capacity. These are (1) pain ; (2) shortening of lower limb ; (3) muscular wasting.

*Pain.*—This, the most important source of permanent incapacity, may be not only severe, but persistent. It may be constant or only elicited by movements, and as such may interfere with walking or sitting. Its causation is variable and frequently obscure. It may be due to *direct involvement of nerves*, notably the obturator branch. But equally important, though frequently unrecognized, is the *static* origin of such pains.

The pelvic arch supports the superincumbent body-weight. Given, therefore, fracture, simple or multiple, with displacement

of fragments, the distribution thereof over the pelvic arch is disturbed. In such cases—the sacrum being the keystone of the arch—strain and fatigue of the muscles and ligaments attached thereto is most likely to ensue. In short, we get a reproduction of all those pains and disabilities associated with *relaxation of the sacro-iliac joint.*

While the foregoing constitute the more common causes of pain, it is clear that in the presence of complications other sources thereof may have to be considered. A more difficult problem is the establishment, not only of the *reality,* but of the *severity* of the suffering, when, as is not infrequent, it is alleged as causing total incapacity.

*Shortening of the Lower Limb.*—This may occur from displacement upwards of that portion of the pelvis which stands in relation to the head of the femur. Fortunately, however, it does not transcend a degree which may be regarded as negligible.

*Muscular Atrophy.*—This more especially affects the pelvic and thigh muscles ; its degree is proportionate to the long period (two to three months) required for the consolidation of the lesions. This, too, by no means always represents the limits of the time required. For, given complications, it may be indefinitely prolonged, and the wasting from disuse accentuated. Nor can we overlook the fact that the frequently associated *erroneous deflection of body-weight* falls with an added stress on the *wasted* muscles. Accordingly the feeling of weakness in such cases readily passes into one of painful fatigue and is doubtless responsible for the state of chronic incapacity into which these patients so frequently drift. (*Vide* "Fibrositis.")

*Fracture of the Ilium.*—Inasmuch as this lesion is usually readily consolidated and does not necessarily involve deflection of the body-weight, *functional recovery* is usually complete. On the other hand, it must be recognized that owing to the severe character of the initial violence, the effects thereof may be transmitted to related anatomical structures, notably the *sacro-iliac joints.* An added factor also may be *weakness* or *pain* due to the avulsion of muscular attachments. Imbert records an instance of this nature in which he was compelled to postulate *permanent incapacity.*

*Fracture of the Acetabulum.*—Unhappily in this variety some depreciation of *industrial capacity* is not infrequent. This owing to the fact that *ankylosis* of the hip of partial or complete nature but too commonly ensues. Imbert relates a case of fracture of the acetabulum in which, after two months, the subject was able to walk with a stick, though with difficulty. *Mirabile dictu,* the hip retained a considerable measure of its

mobility, but in view of the fact that the thigh muscles were notably wasted, Imbert was of opinion that he suffered reduction of industrial capacity to the extent of 20 per cent.

*Fracture of the Sacrum.*—Even favourable cases of this may be followed by *pain* on adopting a sitting posture. If this be persistent and compel a change of occupation, it should unquestionably be taken into consideration in the evaluation. In the graver instances attended by injury to the sacral nerves or rectum these complications will constitute the dominant factors, and for their assessment we would refer the reader to our second volume.

*Assessment*

Fractures, single or multiple, of the pelvic brim, for reasons before cited, may occasion *permanent incapacity* and should be evaluated at 100 per cent. In less grave examples, in which consolidation *without great displacement of fragments* has ensued, the assessment will depend on the *severity of the collateral phenomena* —the persistency of the pain, the degree of muscular atrophy, and the measure of shortening. Most examples exhibit these sequels in varying degree, and as an average assessment the resultant incapacity should be rated at 25 to 35 per cent.

In instances in which there is, in addition to fracture of the pelvis, an *ankylosis of the hip*, these figures must be raised according to the degree of the latter, whether *partial* or *total*. (*Vide* chapter on "Ankyloses.")

The great disparity in the degrees of incapacity that may ensue in sequence to pelvic fractures is reflected in the figures of evaluation of this lesion—as exemplified in the "Wiener Schema," which range from 16 to 100 per cent. The highest figure was allotted in an example of pelvic fracture with resultant *pseudarthrosis*.

*Fractures of the Ilium and Ischium.*—These when devoid, as is usual, of complications should, we think, be assessed at not more than 20 per cent.

*Fracture of the Acetabulum.*—This, if accompanied by *ankylosis* of the *hip*, must be assessed according to the *angle of fixation* of the latter. If in a *favourable* position the rates of evaluation will range from 40 to 50 per cent. Imbert in a case of severe fracture of the acetabulum with ankylosis of the hip would rate the same at 30 to 40 per cent. If ankylosis take place in a *bad* position the figures must be raised accordingly—up to 70 to 80 per cent.

## FRACTURES OF THE FEMUR

### *Upper Extremity*

These were formerly classified as *intra-* or *extra-capsular*, according as to whether or not the line of fracture invaded the joint-cavity. The results of *skiagraphy* have disclosed how impossible it is—without its aid—to effect such a clinical differentiation.

*Fractures of the Neck of the Femur.*—It is to these that the term *intra-capsular* was formerly applied. But skiagraphy showed that in a large number of instances the lesion was partly *intra-* and partly *extra-capsular*. Consequently, while we must recognize that true intra-articular or " sub-capital " fractures may occur, and at the other extreme fractures of the base of neck, there are other instances of intermediate type neither wholly *in* nor wholly *without* the joint.

The true *intra-capsular fracture of the neck* derives importance from its frequent incidence in *aged* persons, with the associated liability to death from hypostatic congestion. Moreover *fibrous* or even *non union* is but too common. Albeit its frequency in *young adults*—until the advent of skiagraphy—was insufficiently recognized. Cases of fracture of the neck were constantly being erroneously diagnosed as a *sprain, avulsion of the epiphysis,* or even *tuberculous* disease. Bony union usually occurs in young subjects.

*Fracture of the Base of the Neck.*—Its line of incidence is usually of *inter-trochanteric* distribution, and the lesion usually the result of extreme great violence, impinging on the great trochanter. Fortunately they occur most frequently in the young, to whom a prolonged sojourn in bed is but irksome, not dangerous as in the old. Bony union may accordingly be looked forward to with confidence. Cases of this nature characterized by marked displacement and rebellious to reduction by manipulation call for operative treatment.

*Fractures of the Great Trochanter.*—This also is usually the result of great violence. In cases—with wide separation of fragments—open operation with fixation may afford the only chance of sound union.

*Separation of the Upper Epiphysis.*—This occurs in subjects under twenty years of age—usually through *direct* violence. Happily rare, it must be recalled that *coxa vara* may follow, i.e. the obtuse angle between the neck and upper end of shaft of femur gradually approximates to a right or even an acute angle.

*Operative and Non-operative Methods of Treatment.*—As to the *functional* results of non-operative and immediate operative

treatment of fractures of the upper extremity of the femur, we may cite the following figures gleaned from the Report of the Fracture Committee of the British Medical Association:

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| Neck . . . | Non-operative | 91 | 16·4 per cent. | 9·8 per cent. |
| | Operative | 1 | 100·0 „ | |
| Separated epiphysis of head . . | Non-operative | 9 | 44·4 „ | 22·2 „ |

Greer, analysing the results of non-operative treatment in a series of 149 cases of fracture of the neck of the femur, concludes that "26 per cent. of good functional results is the best we can expect from non-operative treatment in adults."

Recent opinion displays a strong trend in favour of operative treatment in fractures of the neck of femur. Thus Davison considers that "Autoplastic transplantation of bone is the best treatment for both recent and un-united fractures of the neck of the femur—unless contraindicated by age or condition." Albee also believes bone-grafting to be indicated in (1) all un-united fractures of the neck of femur; (2) in most unimpacted fresh fractures in operable subjects under fifty years of age; (3) in all old fractures of the neck or at the epiphyseal cartilage where mal-union has resulted with the neck depressed in a coxa vara relationship with the shaft.

### *Average Duration of Incapacity*

In cases treated by *non-operative* methods, Forgue and Jeanbrau allot an average of six months for consolidation, but Hänel is of opinion that the *average duration of incapacity* is at least eight months. The following figures as to the results of non-operative methods as opposed to immediate operation are drawn from the Report of the Fracture Committee:

| Age. | Site of Injury. | Non-operative. | Immediate operation. |
|---|---|---|---|
| Under 15 years . | Upper epiphysis and neck | 26·5 weeks | No record |
| Over 15 years . | „ „ „ „ | 52·2 „ | „ „ |
| Permanent incapacity | | | |
| Over 15 years . | „ „ „ „ | 30 per cent. | „ „ |

In the event of complications—e.g. *phlebitis, pseudarthrosis*—the period of incapacity will be correspondingly prolonged. For while the latter may be inoperable, the former is extremely liable to recurrence.

### Factors in Evaluation

While in most fractures of the lower limb inability to maintain the body-weight compels recumbency, it is not necessarily so in those of the upper end of the femur. Thus in *sub-capital* fracture fragments are frequently impacted or held together by periosteum. Consequently a young subject may occasionally be able to walk, and even the old—when recumbent—capable of flexing gradually the hip joint. Indeed, Imbert states that beyond this the victim may—in isolated instances and in certain occupations—compass some measure of work.

Passing from this peculiarity, which was at least worth a brief digression, we must now note the salient elements of evaluation.

#### *The Central Lesion*

In *intra-* and *juxta-articular* fractures what we are most concerned with is restoration of the joint as a mechanical unit. Unfortunately in the type under consideration, *non-union* is the bugbear, hence the recent impetus to operative treatment. Given that the case is one suitable for operation, evaluation must therefore be postponed until the functional results attained are ascertainable.

*Non-union* will of course seriously depress the functional capacity, and the same is true if *vicious union* or *exuberant callus* interfere with the mobility of the joint. Apart from the fact that a stick or crutch may be indispensable, *restricted mobility of the hip* renders the pursuit of certain occupations impossible, e.g. those necessitating full flexion thereof—climbing of ladders, and so forth.

Fortunately *ankylosis* is not usually absolute—the degree of flexion admitting of a sitting posture. As a rule, too, it is the power of *abduction* that is most seriously compromised. We have to recall also that fractures of the neck are marked by *eversion of the foot and leg.*

Here it may be noted that it is more essential to correct *eversion* than to diminish shortening. For the subsequent gravity of the central lesion is much aggravated in a *static* sense by this external rotation of the limb. The body-weight is erroneously deflected, and the static relationships of the hip joint itself being already disturbed by the initial lesion, a condition of *osteo-arthritis* with exuberant outgrowths but too often results. This

in its train brings an added burden of incapacity—associated as it is with pain and muscular wasting.

*Shortening.*—In the *aged* subject its correction as a rule has to be overlooked, because of the associated liability to *hypostatic pneumonia.* At first rarely exceeding an inch it unfortunately tends to increase. This in contradistinction to the shortening incidental to the *extra-capsular* variety, which shows no tendency to aggravation beyond the point at which it stood immediately after the injury. Moreover, if the limb be placed in *abduction* with *extension* and the technique be properly carried out the shortening tends to diminish.

The influence of this factor—*shortening*—on *functional capacity* must be measured by its effect on the gait. *Does it occasion definite lameness?* In other words, is it of such a degree as to be incapable of compensation by pelvic inclination? Generally speaking, shortening does not dominate evaluation in this lesion as in fractures of the *shaft.* For it is clearly overshadowed by the more serious factor—*limitation of mobility* of the joint.

### *Collateral Phenomena*

*Pain.*—An ever-present feature of these cases, it is due in the main to abnormal stresses and strains through *erroneous deflection of the body-weight.* Its degree is proportional to the measure of the disturbance of bodily equilibrium. Given *non-union* or *vicious consolidation* the pains will be persistent with a tendency to exaggeration through secondary joint changes.

*Muscular Wasting.*—This is an invariable accompaniment of the *partial ankylosis* that so commonly ensues. Given, too, the onset of secondary osteoarthritic changes it tends to become more marked. Naturally, it adds much to the incapacity already produced by the more purely mechanical factors.

As to other complications we have to mention *hydrarthrosis of the knee,* which may or may not terminate in a partial ankylosis. But in cases in which total incapacity—*qua* the fracture—already exists, this particular lesion should not, in Imbert's opinion, weigh to any extent in evaluation. For the rest, *phlebitis*—as always in lesions of the lower extremities—is a possible contingency. It may be slight and pass away without exercising any influence on the ultimate functional capacity. But if serious it greatly prolongs the period of incapacity and may in a very real sense depreciate the residual working powers.

### *Assessment*

In assessing these cases one should always take into account the *age* of the subject. In the old it constitutes in effect an in-

firmity of a grave and progressive character. It should therefore, in many instances, be held as predicating total incapacity, and we may have the less compunction in that the annuity or compensation will probably not extend over a long period.

Given that the subject is young or middle-aged, the evaluation will depend mainly on two factors: (1) *the degree of ankylosis;* (2) *the degree of shortening.*

Is the ankylosis *total* or *partial*? If the former, what is the *angle of fixation*? Is it favourable—viz. has ankylosis ensued in a position of election, i.e. in *extension without flexion, abduction, adduction,* or *rotation*?—or is it unfavourable—viz. fixed in flexion and adduction?

For ourselves, we would suggest that in cases of *total ankylosis* of the hip in an *unfavourable* position, the resultant incapacity should be rated at from 70 to 80 per cent., the higher figure being reserved for aged persons for whom total incapacity must be predicated.

If the ankylosis ensue in a *position of election* the assessment should be from 40 to 50 per cent., or in isolated instances even lower.

Turning now to Continental evaluations, it is clear that—when judged by the wide range of the figures of assessment—these cases display great variations in the degree of functional incapacity imposed. Those of German jurisprudence vary from 15 to 75 per cent., those of Austrian up to 83 per cent. Imbert's estimates also range from 15 to 75 per cent., his assessment of incapacity on the average stands at 55 per cent., that of Hänel at 56, of Müller at 51 per cent.

It is obvious that the lower assessments quoted are only appropriate for a young subject, capable of almost complete adaptation to the consequences of his disability. Cases must be of a very benign nature to merit only 15 per cent.—as judged from a *functional* standpoint fracture of the neck of the femur is held to be more serious than any other lesion of this nature occurring in the lower limb.

In conclusion, the French "Guide Barème"—basing its evaluation on *shortening* and *limitation of mobility* of the hip, especially *abduction*—rates the incapacity at from 60 to 70 per cent., the latter being reserved for instances in which shortening exceeds 10 cm. "Le Jurisclasseur" for the same disability cites 70 per cent., while in instances of *pseudarthrosis* or flail-like joint the French "Guide Barème" assesses the disability at the same figure.

## Fractures of the Shaft of Femur

These injuries may be caused by *direct* or *indirect* violence and may be located at the upper, middle, or lower third of the bone. Fractures when *transverse* are usually caused by direct

violence, and may not be accompanied by much displacement. If *oblique*, they are usually the result of indirect violence, and in this case are frequently compound or comminuted, and generally accompanied by marked shortening through overlapping.

In *civil* life *indirect* violence is responsible for the majority. According to Lawrence Estes' analysis of 760 tabulated cases, working men between twenty to fifty years of age furnish a large share of the examples. The middle third is the site of predilection, and in the above observer's series the average shortening before reduction was $1\frac{3}{8}$ inches. This in consolidated cases was lowered to half an inch.

*Gunshot fractures* of the thigh, as elsewhere, display as their special characteristic *comminution*—the local "starring" being accompanied by fissures extending more or less through the long axis of the bone. The central medulla as a consequence is often laid open. The liability to infection with *chronic osteomyelitis* with resultant fistulæ invests the compound fractures of war with an added gravity as compared with similar lesions in civil life. The associated loss of substance often leads to marked *shortening*, while osteoarticular complications are not uncommon.

In *civil* life the results of non-operative and immediate operative treatment of fractures of femur may be gathered from the following table drawn from the Fracture Committee's Report:

*Results of Non-operative and Immediate Operative Treatment of Fractures of Femur*

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| Upper third of shaft | Non-operative, all ages | 96 | 54·1 per cent. | 4·2 per cent. |
| | Ditto, under 15 . . | 47 | 87 „ | 8 „ |
| | Operative, all under 15 | 3 | 100 „ | — |
| Mid third of shaft | Non-operative, all ages | 436 | 67·8 „ | 13·2 „ |
| | Ditto, under 15 . . | 328 | 87 „ | 7·8 „ |
| | Operative, all ages . | 27 | 92·5 „ | — |
| | Ditto, under 15 . . | 25 | 96 „ | — |
| Lower third of shaft | Non-operative, all ages | 104 | 58·6 „ | 15·3 „ |
| | Ditto, under 15 . . | 50 | 86 „ | 8 „ |
| | Operative, under 20 . | 2 | 50 „ | — |
| Lower extremity involving knee | Non-operative, all ages | 12 | 41·6 „ | 8·3 „ |
| | Ditto, under 15 . . | 2 | 100 „ | — |
| | Operative . . . . | 1 | A moderate result only | — |

In regard to treatment of *gunshot* fractures the trend of opinion, though divided, leans towards *non-operative* methods. It is very widely held that accurately applied *extension methods* give the best results. Sir Robert Jones's opinion is that "Surgeons should abandon all methods designed to immobilize the fractured ends by operation."

### *Average Duration of Incapacity*

If good alinement of the fragments is achieved, recovery will take place in from four to six months, but in many instances the periods will be as much as twelve months. Imbert states that bony union occurs in from forty to sixty days, but *functional* restoration will of course be delayed, pending the subject's recovery of the power of walking. The influence of the treatment, whether operative or non-operative, on the period required for consolidation is shown in the following table from the Report of the Fracture Committee:

*Average Duration of Incapacity*

| Age. | Site of Injury. | Non-operative. | Immediate operation. |
|---|---|---|---|
| Under 15 years . . | Shaft . . | 16·5 weeks | 16·2 weeks |
| Over 15 years . . | Shaft . . | 33·6 „ | 52 „ |
| Permanent incapacity over 15 years . . | Shaft . . | 11·7 per cent. | None |

### Factors in Evaluation

The most frequent and the most prominent is *shortening*, which as a result of displacement may reach in some cases as much as two to three inches. In addition the lower fragment of the leg and foot are—through the action of gravity on the unsupported limb—*rotated outwards*. Other possible factors to be taken into consideration are muscular wasting, articular complications, pseudarthrosis, vicious union, etc.

### *The Central Lesion*

*Shortening*.—Union with shortening and deformity is unhappily very common. Hennequin, however, out of his vast experience maintains that not even in the worst cases should it exceed 1–1½ cm. Imbert, discussing a number of instances treated by various

surgeons, affirms that he has never seen one in which shortening was wholly absent. Under the best conditions the limb suffers a diminution of 1 cm. or more often 1½ cm., *sub-periosteal* and *green-stick* fractures being excluded. The average shortening in the series of cases observed by him was from 3–3½ cm., and Liniger, from an average of 300 cases, arrived at the same figure. Prorok in 103 cases found in seven 5–6 cm. shortening, in five 6–7 cm., in three 8–9 cm., and one of 9–10 cm. When the fracture is situated in the *upper third*, shortening is aggravated by the fact that owing to the action of the iliopsoas and gluteal muscles, the upper fragment is usually in a flexed and abducted position, while the lower fragment is adducted and displaced upwards. This accounts for the fact that shortening is more marked in this variety, the shortening before reduction varying from 4–8 cm. In the *middle third* it ranges from 3–6 cm., and in the *lower third* from 2–4 cm.

*Shortening in Gunshot Fractures.*—The Inter-Allied Conference above referred to held that of all deformities due to incomplete reduction (shortening, rotation, and angular union) *shortening* is the most common and the only one which is not always avoidable (loss of bone). This loss of substance is due to that most common late complication—chronic infective osteomyelitis.

In *gunshot fractures* we meet with very special frequency *true shortening without overlapping or angulation.* Still even with great *loss of substance* it is astonishing how little shortening often results. According to W. I. de C. Wheeler he has seen "four inches of the femur replaced by osteogenetic processes in a limb merely hanging on by the soft tissues which contain the vessels on the inner side. The patient recovered with an inch shortening and only inconvenienced by ankylosis of the knee joint."

If four, six, or more inches of the bone are lost in fractures of the thigh and the ends thereof appear bare in the wound, and in addition there are manifest signs of septic absorption, Hey Groves thinks it advisable to amputate the limb—holding that the most to be expected is a flail-like thigh six inches shorter than its fellow. On the other hand, he is of opinion that in a similar case, showing rapid healing of the wounds, with general health and vigour retained, it is worth waiting for a future bone-graft.

*Vicious Union.*—This occurs more commonly in the *upper third*, and according to Imbert is generally attended by very severe and persistent pains, more so than fracture in any other part of the thigh.

The Inter-Allied Surgical Conference on this point hold that deviations of marked character—whether accompanied or not

by osteomyelitis—are amenable to osteotomy or resection of callus.

*Pseudarthrosis.*—This, if inoperable, predicates an almost absolute incapacity of the limb which in degree even exceeds that of loss of a member, for which at least an artificial substitute may be forthcoming.

*Abnormal Rotation of Foot.*—Lawrence Estes in his series of cases noted that most of the subjects limp for some time. In a little less than a fifth of the cases there was inversion or eversion of the foot, or tilting of the pelvis from serious axial displacement, and excessive callus in a little more than a tenth.

The Inter-Allied Conference discussing rotation remarked that it is not only amongst the late complications commonly met with, but in the majority of instances is attributable to inefficient surgical treatment.

### *Collateral Phenomena*

*Pain.*—This while frequent enough is rarely so important a feature as in fracture of the leg. But if the fracture be in the lower third the pain may be due to pressure on the popliteal nerve —the harbinger of a future paralysis.

*Muscular Atrophy.*—This affects chiefly the quadriceps muscle and impairs greatly the *functional capacity* of the limb. For extension of the knee—essential for correct walking—is greatly weakened. It follows therefore that mounting or descending stairs or ladders is difficult—the whole body having to be lifted instead of the leg only. The attitude of kneeling—so essential in many vocations—may become almost impossible, the workman being unable to kneel on one leg for any length of time. The functional incapacity therefore is very similar to that met with in fracture of the *patella*, and when well marked this factor should be taken into consideration in evaluation.

The Inter-Allied Conference hold that *functional loss of power* (whether of nervous, muscular, or articular origin) is very rare. But they add that *adhesions of the muscles* to the callus occasion many functional troubles for the cure of which surgical operation is necessary.

*Articular Complications.*—In fractures of the upper third *stiffness of the hip joint* may ensue. This, however, relents more swiftly to treatment than stiffness or limitation of mobility in the *knee*, of which Kaufmann noted 55 examples in 103 cases. The Inter-Allied Conference arrived at the conclusion that the joint stiffness so frequently observed in the knee, hip, and foot —either separately or in combination—can be prevented by early mobilization.

Broca, however, lays stress on the frequency with which *incomplete ankylosis of the knee* follows *osteomyelitis* if it involve the lower end of the femur.

*Laxity* of the knee was observed by Liniger 75 times in 300 cases. It discloses itself sometimes by a hyperextension of the knee and sometimes by excessive lateral mobility. Effusion in the knee, either serous or hæmorrhagic, is very common, having been met with by Hennequin in 40 out of 44 cases. Spontaneous cure is the rule, operation is not indicated, and no permanent incapacity results.

*Hydrarthrosis* may ensue at the time of accident, more commonly later when the subject begins to move about, but the prognosis in either case is favourable.

*Trophic Complications.*—These (viz. muscular atrophy, œdema, vasomotor disturbances), according to the Inter-Allied Conference, play an important rôle in determining the late-results of fractures of the thigh, and early and persistent treatment thereof is essential.

*Assessment*

Broadly speaking, in all countries the core of assessment is the *degree of shortening*. Given sound union and good alinement—viz. little or no shortening—a fracture of the femur may leave no trace of *permanent incapacity*. Thus Liniger out of a series of 300 cases found that in 15, or 5 per cent., the subjects obtained *no indemnity*. Turning to Austrian statistics we find here also that in an appreciable number no permanent depreciation in working power resulted. Out of 836 cases 7 per cent. were definitely cured, while 96 received an indemnity for only six months—giving a total of 18 per cent. of instances in which the cure was complete. In the remainder the industrial incapacity was assessed at, on an average, 50 per cent. In respect of French statistics, the evaluations of Duchauffour range from 11 to 44 per cent.

Imbert, discussing the foregoing figures, lodges the following objection to German findings—viz. that exaggerated importance is attached to *shortening*. (German authorities in shortening of 1 cm. only grant no indemnity.) The French expert contends that the chief factors in producing incapacity are not shortening, but rather *muscular atrophy, vicious union, articular stiffness*.

Few will dispute that Imbert's criticism is apposite. This especially if we recall that our evaluation should be based on *functional* results and not solely on the anatomical findings. Nevertheless we cannot minimize the effects of shortening. For conceding the fact that *slight shortening*—if uncomplicated by muscular wasting, etc.—leaves *no permanent incapacity*, it must

be admitted that—*when of high grade*—correction is difficult and the depreciation of working powers considerable, save in those who pursue a sedentary occupation. Also given that shortening is due to *angular deformity*, such may aggravate mechanically the inefficiency of muscles already weakened through wasting.

In short, the influence of this factor *per se* on the ultimate *functional efficiency* of the limb cannot be gainsaid. Its effect may be aggravated by *muscular wasting* or other complications, but generally speaking analysis of the recorded tables of evaluation shows that *pari passu* with increase in shortening an increase in industrial incapacity follows.

The French "Guide Barème" in assessing fractures of the shaft of the femur divides them into the following groups:

1. *Favourable cases with shortening of* 1–2 *cm.* without muscular wasting or articular stiffness 10–20 per cent.
2. *Medium cases with shortening of* 3–6 *cm.*—moderate muscular wasting, good alinement, no complications articular or otherwise; on an average . . . . . 20–40 ,,
3. *Grave cases with shortening of* 6–10 *cm.*—pronounced atrophy, articular stiffness, and abnormal rotation of foot (the foot turning towards its fellow, as in cases of subtrochanteric fracture) . . . . 50 ,,

The foregoing rates of evaluation leave little, we think, to cavil at—at any rate as regards the first two classes. This especially if the victims are young—capable of accommodating themselves more readily to the residual disability. In group 2 the figures 20–40 represent only the *average* estimate—an index that in some examples a higher award is justifiable. Such would be indicated in older subjects, those with marked *muscular atrophy* or complicated by the involvement of nerves in callus. The *pain* associated with the latter, as Greer observes, is often a cause of incapacity, and standing for a length of time is sometimes impossible. Accordingly we should not hesitate in such to evaluate them up to 50 per cent., and in older men up to 60 per cent.

The assessment of the grave cases comprised in group 3 at 50 per cent. should also, we think, be regarded as an *average* estimate—to be elevated in older subjects or in those ill-equipped to undertake the acquirement of a new occupation.

Of all the complications *pseudarthrosis* is the most crippling. Imbert, like Remy, evaluates the incapacity in such at 60 per cent. The same figure is accepted by the French "Guide Barème,"

but Ollive and Le Meignen would rank it as equivalent to total loss of a limb—a reasonable assumption if the case be inoperable. In cases of *vicious union* associated with great shortening and pains the resultant disability is assessed by the French "Guide Barème" at 70 per cent.

## Fracture of the Patella

It may be due to (1) indirect or (2) direct violence. The former is the more frequent and the outcome of muscular action—viz. violent contraction of the extensor quadriceps in an effort to regain the balance after a stumble or fall. Given this mode of production the fracture is *transverse*, and the joint being involved *effusion* occurs. If treated by conservative methods *bony* union is unlikely. This because of the separation of the fragments which ensues through muscular action aided by inter-articular effusion. If due to *direct* violence, the fracture is usually star-shaped, and the aponeuroses being untorn generally no displacement occurs.

### *Operative and Non-operative Methods of Treatment*

Given early massage and movement the prognosis in *stellate longitudinal* or *sub-aponeurotic* fractures is usually good. *Transverse* fractures with separation or with aponeurotic tags interpolated between the fragments are more gravely placed as regards full functional recovery. For unless sutured, transverse fracture of the patella with separation does not undergo bony union.

Thiem, who has devoted considerable study to these cases, deduced the following facts from an analysis of 283 examples: Of these 223 were treated by conservative methods and only 20, or 9 per cent., resulted in complete cure. As opposed to this, in 60 cases treated by operation perfect functional recovery ensued in 45, i.e. 75 per cent.

Bahr in a study of 44 cases examined some four years after the accident arrived at the following conclusions: In no less than 42 some weakness remained—tantamount to a depreciation by 35 per cent. of the working power—thus giving only 4·5 per cent. of good results. Power, in 1898, contributes a study of 711 cases treated by operative methods—with a mortality of 1·4 per cent. The ultimate functional results in 94 per cent. were satisfactory. Marked stiffness and disability followed in 3 per cent., and in 1 per cent. total ankylosis. In Lockwood's series of cases treated by operation good bony union and useful limbs were claimed in 91·6 per cent.

### *Average Period of Incapacity*

This differs widely according to the method of treatment whether *operative* or *non-operative.*

In Thiem's series above cited the total incapacity in cases not operated upon endured on the average for six months—viz. in 80 per cent. for five, 30 per cent. for eleven, 20 per cent. for fifty, and 10 per cent. for a hundred months. Imbert in non-operative cases allots six to twelve months, which in cases successfully operated upon is reduced to from two to three months. This accords with Greer, who observes that under operative treatment the period of incapacity will be from two to three months ; under conservative treatment from 6 to 12 months.

## Factors in Evaluation

### *The Central Lesion*

*Width of Inter-fragmentary Gap.*—Separation of the fragments is the bugbear of transverse fractures. But even with fibrous union a useful joint may result if the interconnecting layer does not exceed in length a quarter to half an inch. Unhappily it often reaches one to two inches, and even when originally short the fibrous lamina is always menaced by subsequent elongation.

These consequences from a *functional* point of view are sufficiently disabling. For when attempts are made to extend the leg, much of the extensor effort is expended uselessly—viz. in widening the gap between the fragments. In other words, the power of extending the leg is weakened and the subject finds it difficult to rise from a stooping posture or, when recumbent, to raise the leg from the horizontal plane. This inability to extend the flexed knee hampers not only walking but mounting and descending stairs, ladders, etc., especially their descent.

### *Collateral Phenomena*

*Muscular Atrophy.*—The very volume of the extensor muscles indicates their prime importance and—given notable atrophy thereof—the *functional* utility of the limb sinks correspondingly.

While these two factors—the separation of the fragments and extensor wasting—are the salient factors, others will also have to be taken into consideration.

*Articular Effusion.*—This is always present and contributes in no small measure to the separation of the fragments. Evacuated by puncture or incision it may nevertheless recur, and the *hydrarthrosis* brings its own Nemesis. For when oft repeated

it leads to overdistension and stretching of the capsule and ligaments. Lateral movement is then possible and the joint becomes flail-like in character.

*Intra- or Peri-articular Adhesions.*—The *hydrarthrosis* after its final disappearance may leave behind it adhesions of intra- or peri-articular type. In this event we may have not only impaired power of *extension* but a difficulty also in *flexion*. In range this latter may not be possible up to a right angle or even less. In such event the subject's incapacity is greatly aggravated. By reason of his impaired power of extension he is unable to rise from a crouching position. But apart from this the assumption of this same crouching attitude—which necessitates strong flexion of the knee—can no longer be achieved.

*Assessment.*

As before remarked, in transverse fracture the salient *functional* disability is *difficulty of extension*. Our assessment therefore will be based on determination of the degree of this particular incapacity. To ascertain this point the subject is best examined in bed in a recumbent position with the leg extended.

He is then asked to raise the heel from the bed. Then—the knee being flexed—he is asked to extend it, and sometimes it will be beyond him to achieve these simple movements. During their performance one will have noted that the contraction of the extensors is transmitted but feebly to the leg; its first effect being to cause the upper fragment to cock up—this indicating that the fibrous band is extensible. It then rests with us to see to what extent walking is impeded—especially on uneven surfaces. For on the level the man may walk with assurance, but not so on uneven ground. Coming into contact with any obstacle, however slight—the extensor muscles not having strength to cope with the difficulty—the leg and foot lag behind. The result is that the weight of the body suddenly falls upon the flexed knee and a fall results. Lastly, one should ask the person to stoop and then to straighten up—in which process it will be found that he achieves it mainly through the extensor muscles of the sound limb.

As to the estimates of resultant incapacity the decrees of German jurisprudence range from 30 to 50 per cent., those of Austrian authorities from 30 to 40 per cent. These figures probably relate to cases treated by *non-operative* methods, as they are obviously too high for those subjected to operation. On the other hand, Remy's estimates range from 10 to 30 or 40 per cent.—figures which closely approximate to those

cited by the French "Guide Barème." They recognize two groups:

1. Favourable cases—little or no separation, muscular atrophy slight . . . . . 10 per cent.
2. Average cases, wasting of 3–4 cm. . . 30–40 ,,

To sum up, the incapacity entailed may range from 10 to 50 per cent.—the latter figure being reserved for those requiring the use of a retentive apparatus. As opposed to this, in transverse fractures—those operated on successfully with only slight muscular atrophy with little or no separation—the assessment may be lowered to 10 per cent. or even less.

The French "Guide Barème" in cases of patellar fracture, in which a pseudarthrosis is present, gauges the resultant incapacity at 20 per cent.—if notwithstanding muscular atrophy movements are preserved. But in instances marked by exaggerated separation of the fragments entailing great difficulty in extension, they rate it at 40 to 50 per cent.

## Fractures involving the Knee Joint

Under this heading are included fractures of (*a*) the lower extremity of the femur, and (*b*) the upper extremities of the tibia and fibula. To the first group are to be referred: (1) fracture of either condyle; (2) T-shaped or inter-condyloid fracture; (3) separation of the epiphysis.

In the second category will be included fracture of (1) the tibial tuberosities; (2) the tibial spine; (3) the upper extremity of tibia and fibula; and (4) separation of the upper epiphysis of tibia.

*Direct* violence is usually responsible for these injuries, and their gravity resides in the liability of the line of cleavage invading the knee joint. Distension of the articulation with blood and inflammatory products follows, and stiffness is very likely to ensue.

*Gunshot* fractures labour under the constant menace of *infection.* In those involving the lower extremity of the femur a *chronic osteomyelitis* may supervene—with inflammatory hyperostosis—this latter interfering mechanically with the amplitude of the joint movements. Apart from this, in these septic fractures an *infective arthritis or periarthritis* with resultant ankylosis or limitation of mobility is but too common. Of the foregoing fractures, those involving the upper end of the tibia and fibula are particularly grave, and usually the result of extreme violence. (Haydenreich in 39 cases records 6 deaths and 7 amputations.)

*Results of Non-operative and Immediate Operative Treatment*

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| Lower extremity involving knee | Non-operative, all ages | 12 | 41·6 per cent. | 8·3 per cent. |
| | Ditto, under 15 . . | 2 | 100 „ | — |
| | Operative . . . | 1 | A moderate result only | — |

The foregoing figures are taken from the Report of the Fracture Committee, but are too few in number to permit of any definite conclusions being drawn.

*Average Duration of Incapacity*

The period of delay is longer than in most other fractures of the lower limb. Full working capacity is rarely restored under six to twelve months—the higher figures relating to T-shaped fractures. The following table as to the average duration of incapacity in cases treated by immediate operation, as opposed to conservative methods, is drawn from the Fracture Committee's Report:

*Average Duration of Incapacity*

| Age. | Site of Injury. | Non-operative. | Immediate operation. |
|---|---|---|---|
| Under 15 years . . | Lower extremity | 18·2 weeks | No record |
| | Lower epiphysis | | |
| Over 15 years . . | Lower extremity | 18·7 „ | 26 weeks |
| | Lower epiphysis | | |
| Permanent incapacity, over 15 years . . | Lower extremity | 25 per cent. | None |
| | Lower epiphysis | | |

## Factors in Evaluation

*The Central Lesion*

Exact differentiation of the type of fracture is highly desirable, and for this *radiography* is essential. In the light of its revelations we can moreover satisfy ourselves as to the actual cause of the resultant disability—its amenability or not to surgical intervention.

*Displacements.*—In *fracture of the external or internal condyle* lateral deviations are likely to ensue with resultant *genu valgum* or *varum* respectively. If reduction cannot be satisfactorily achieved or the displacement tend to recur it will prejudice greatly the future functional efficiency of the limb. Fixation by open operation may, however, be practised, and in such event evaluation must be postponed until the ultimate results can be gauged.

*Avulsion of the epiphysis,* if complete, may be complicated by pressure of the lower end of the shaft upon the *popliteal vessels* or *nerves.* Again, defective growth leading to shortening of the bone is a likely sequel.

Detachment of the *anterior tibial tuberosity* and therewith of the insertion of the patellar ligament places the subject in similar plight to the man who fractures his patella. If bony union occur the power of extending the leg may be wholly regained ; but not so if the bond be fibrous. (*Vide* "Fracture of Patella.")

*Ankylosis.*—Fractures of the femoral condyles or of the tibial tuberosities—whether T-shaped or otherwise—are but too likely to be followed by ankylosis. The ultimate *functional efficiency* of the limb will depend on whether it has ensued in a good or bad position. The *angle of fixation* is of course the main point at issue. In *partial* ankylosis the particular *arc of mobility retained* must be taken into consideration. (*Vide* chapter on "Ankyloses.") *Intra-articular effusion* if very persistent may lead to impaired efficiency by reason of the resultant *laxity of the capsule.*

### *Collateral Phenomena*

*Muscular Atrophy.*—Injuries of the knee joint lead to *rapid wasting of the thigh muscles*—attributed by some to immobilization and by others, like Hoffa, to a reflex atrophy from articular irritation. The latter is based on the fact that the muscular wasting supervenes in subjects who have not remained in bed, and Sudek claims that the condition is analogous to acute bone atrophy.

Clinically one notes that the movements of the knee are preserved, but they lack vigour. The subject finds it difficult to mount or descend stairs and to rise from a sitting position. In view of these disabilities it is essential in attempting to evaluate the residual *functional* capacity that the degree of *muscular atrophy* be taken into account.

### *Assessment*

For the figures of assessment relating to *ankyloses,* whether total or partial, we would refer the reader to a previous chapter.

But here we would insert the figures cited by the French " Guide Barème " :

**Ankyloses**

*Limitation of Mobility*

| | |
|---|---|
| (*a*) *In good position*, either in full or nearly full extension . . . . . | 30–40 per cent. |
| (*b*) *In unfavourable or angular position*—viz. with the knee fixed at an *acute*, a *right*, or an *obtuse* angle, necessitating a pilon or other apparatus. . . . . | 60 ,, |

*Restricted Mobility*

| | |
|---|---|
| (*a*) With *retention of favourable* arc of movement —viz. from the vertical to 25–45° backwards . . . . . | 10–20 per cent. |
| (*b*) With *retention of unfavourable* arc of movement . . . . . | 20–30 ,, |

*Vicious Union*

| | |
|---|---|
| (*a*) Determining an ankylosis in flexion (*vide* above) | |
| (*b*) Determining after ankylosis a genu valgum | 50 per cent. |
| (*c*) Determining after ankylosis a genu varum | 50 ,, |

*Hydrarthrosis*

| | |
|---|---|
| If of persistent character and marked by muscular wasting and relaxation of the joint capsule . . . . . | 10–20 per cent. |
| Pseudarthrosis or a flail-like joint . . | 50 ,, |

Fracture of the *anterior tuberosity* with only fibrous consolidation must be judged as producing an industrial incapacity equivalent to that met with in fracture of the *patella* with fibrous union.

As to involvement of the *external popliteal* nerve in callus after fracture of the upper end of fibula we would refer the reader to a coming section dealing with injuries of the nerves.

## Fractures of the Shafts of the Tibia and Fibula

Either the tibia or fibula may be fractured alone, but often both bones are broken simultaneously.

Fracture of the *fibula* alone is very commonly located at the juncture of the upper and middle thirds, or about 4 inches above

the external malleolus. This latter type will be considered later, as here we are concerned only with fractures at a higher level, in which the ankle joint is uninjured and the foot not displaced.

Fracture of the *tibia* is usually due to direct violence and nearly always transverse. But as the fibula is uninjured it entails —even if oblique—but little displacement or shortening.

Fracture of *both bones* is extremely common. If due to *direct* violence fractures may occur at any level, otherwise the tibia most often breaks near the junction of the middle and lower thirds—the fibula usually at a higher level. In many cases the displacement is of such a nature that open operation with direct fixation of the fragments gives the only hope of union in a good alinement.

*Results of Non-operative and Immediate Operative Treatment of Fractures*

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| Shaft of tibia | Non-operative, all ages | 424 | 74·4 per cent. | 10·7 per cent. |
| | Ditto, under 15 | 223 | 95 „ | 2 „ |
| | Operative | 17 | 76·4 „ | 17·6 „ |
| | Ditto, under 15 | 7 | 100 „ | — |
| Shaft of fibula | Non-operative, all ages | 152 | 70·5 „ | 3·9 „ |
| | Operative | 2 | 100 „ | — |
| Both bones | Non-operative, all ages | 548 | 44·4 „ | 25·6 „ |
| | Ditto, under 15 | 116 | 94 „ | — |
| | Operative, all ages | 22 | 63·6 „ | 4·5 „ |
| | Ditto, under 15 | 2 | 100 „ | — |

The above table is drawn from the Report of the Fracture Committee, and to it are we also indebted as to the average duration of incapacity in cases treated by conservative methods as opposed to immediate operation:

*Average Duration of Incapacity*

| Age | Site of Injury. | Non-operative. | Immediate operation. |
|---|---|---|---|
| Under 15 years | Shafts | 12·8 weeks | 9 weeks |
| Over 15 years | Shafts | 26·7 „ | 31·2 „ |
| Permanent incapacity, over 15 years | Shaft | 8·1 per cent. | 9 per cent. |

## Factors in Evaluation

### *The Central Lesion*

The outstanding elements are shortening, vicious union, and pseudarthrosis, and to their significance we shall now advert.

*Shortening.*—The diminution in length that follows fracture of the shafts of the *tibia* and *fibula* is less than in *fractures of the thigh*, and its functional ill-effects correspondingly attenuated. It usually amounts to 3 cm. or more, whereas in the thigh it reaches 4 cm. or more.

The shortening being relatively slight is largely compensated for by *pelvic inclination*. In young people their adaptation thereto may be most remarkable—compensating for as much as 4–5 cm. Indeed, if it does not exceed 2–3 cm. even limping may be hardly noticeable or wholly absent.

*Vicious Union.*—If the *functional* results of mere *shortening* are relatively trivial, it must be recalled that in many instances union takes place in a vicious position. If the tibial fragments unite at a marked angle with pronounced *shortening*, the subject may be reduced to walking with his foot in a position of *equinus*. Or in aggravated cases walking may be impossible without the aid of an artificial limb.

*Pseudarthrosis.*—If this untoward contingency occur, the resultant disability is very serious. Indeed, if it prove rebellious to surgical measures, it is almost equivalent to total loss of *functional* capacity in the limb.

### *Collateral Phenomena*

*Muscular Wasting.*—It may be restricted to the leg, and in some instances the muscles of the thigh are involved. While wasting of the calf muscles *per se* renders walking difficult, the *functional* disability is much more marked if those of the *thigh* are also implicated—owing to enfeeblement of the power of *extension*. It is probable, too, that in fractures of the lower third of both bones the associated *atrophy of the calf muscles* plays its part in the genesis of the foot-deformities that sometimes ensue—viz. eversion and sinking of the plantar arch—a type of *traumatic flat-foot*.

In fractures of the shafts muscular wasting in some degree may be said to be invariable, but it is especially pronounced following prolonged immobilization, or if the case be complicated

by suppuration or articular lesions. In these more severe instances, although amelioration may sometimes follow massage, the muscles never regain their pristine volume, and the limb is permanently weakened.

*Pain.*—This may be *spontaneous* or *provoked.* The former variety generally subsides rapidly, but not always. In some a veritable neuralgia develops, which the researches of Sudek and others would suggest is possibly due to a *rarefying osteitis* involving not only the articular ends, but also the shafts of the fractured bones. This pathological process may undergo spontaneous regression, but not always, and the pains may prove persistent and intractable.

More important are the pains *provoked by walking, standing,* or *slight blows.* Not only more frequent in incidence, they are also more persistent than the spontaneous variety and consequently are more disabling.

These deep pains, while they take origin at the seat of fracture, often extend to the neighbouring joints, commonly the tibio-tarsal articulation. Another factor in their causation is doubtless the *erroneous deflection of body-weight*—due to faulty deviation of the axis of the leg. This of course reacts on the subjacent joint, which even though uninjured becomes the seat of chronic overstrain. Lastly, the pain may be purely *localized,* due to projection of an osseous spicule beneath the skin, or to involvement of a nerve.

*Œdema.*—We need not concern ourselves here with inflammatory œdema—so constant and early a feature in fracture of the leg —but only with that particular form which manifests itself when the subject begins to be up and about.

It is probably referable to many factors. Its presence sometimes in the opposite and *uninjured* limb points to posture playing a part in its genesis. In the *injured* limb its aggravation is due to obstruction of the *circulation* by displaced fragments—reinforced in some instances by a coincident *phlebitis.*

Its *site* varies with the location of the fracture—most marked when the lesion is localized at the junction of the middle with the lower third. It extends from the level of the fracture downwards just up to the instep, but the foot and toes are but little involved.

Its *duration* is variable—it may pass away after a few months or endure for years. It is naturally most pronounced in those cases which make a bad functional recovery. This because to a certain extent *muscular exercise* favours subsidence of the swelling.

*Assessment*

Given sound union and *good alinement*, a fracture of the tibia or fibula alone may occasion no loss in the subject's capacity for work.

Fractures of the tibia with *vicious union* may entail a high measure of incapacity. The French "Guide Barème" distinguishes two categories, according as to whether the angular deviation with shortening admits or not of the subject's walking.

(*a*) If still possible the incapacity is evaluated at 40 per cent.
(*b*) If impossible save with the aid of a pilon—
the knee being flexed . . . . 50 ,,

The same authority, in fractures of the *mid-shaft* of the tibia (marked by shortening of 1–3 cm., slight but distinct muscular atrophy, articular stiffness likely to disappear, and persistent though gradually diminishing œdema), evaluates them on the average at from 25 to 30 per cent. ; pseudarthrosis, 60 per cent.

Léon Imbert, whose figures of evaluation are frequently invoked by the French "Guide Barème," adds some interesting remarks on the resultant incapacity in fractures of both bones. Some measure of incapacity, he observes, always remains, which ranges from 10 to 60 per cent. or more. Most cases lie somewhat between these two extremes—viz. examples marked by shortening of 1–3 cm., moderate atrophy, temporary stiffness, and œdema. In such an instance the residual incapacity may be rated at 25 per cent., but should the case occur in an old man or be marked by vicious union the higher figures above quoted must be allotted.

## Fractures of the Tibia and Fibula involving the Ankle Joint

These are of the greatest importance on account of the likelihood of some permanent deformity or stiffness of the joints leading to serious interference with the normal function of the limb. The following fractures are included in this group : (*a*) fracture of the internal malleolus ; (*b*) Pott's fracture ; (*c*) separation of the lower epiphysis of the tibia.

(*a*) *Fracture of the Internal Malleolus.*—This may be broken alone either as the result of direct violence or after forcible inversion of the foot. In the former, displacement will be slight, but in the latter the foot may be strongly inverted with displacement backwards of the astragalus and plantar flexion of ankle. In this as in the following fractures the ankle joint is involved.

(*b*) *Pott's Fracture.*—This somewhat elastic term is applied to a fracture of the lower end of the fibula, associated with eversion of the foot and backward displacement of the astragalus. The strain thus thrown on the internal lateral ligament leads to rupture thereof or fracture of the internal malleolus.

*Dupuytren's fracture* is merely a more severe form of this injury. It also is produced by violent eversion of the foot, but in addition the inferior tibio-fibular ligament is ruptured. As a result thereof the bones are separated at the inferior tibio-fibular joint, thus allowing excessive outward displacement of the foot. Moreover the astragalus may be forced upwards between the tibia and fibula.

(*c*) *Separation of the Lower Epiphysis of the Tibia.*—This is the analogue in children of Pott's fracture, and due usually to violent eversion of the foot. The ankle joint is not necessarily involved as the epiphysial line is situated above the level of the joint. The fibula is usually also fractured, and the displacement closely resembles that of Pott's fracture.

*Results of Non-operative and Immediate Operative Treatment of Fractures*

| Site of Injury. | Treatment. | Cases. | Good anatomical and functional. | Poor anatomical; good functional. |
|---|---|---|---|---|
| Pott's fracture | Non-operative, all ages | 246 | 37·5 per cent. | 10·4 per cent. |
| | Ditto, under 15 . . | 8 | 87·5 „ | 12·5 „ |
| | Operative, all ages . | 4 | 50 „ | — |

From Greer's article in the "Index of Prognosis" we gather that Hitzrot traced 64 non-operative cases of Pott's fracture one year after injury. Of these, 38 cases were under thirty-five years of age, and the *functional* results attained in all were perfect. Of 12 between thirty-five and fifty years, "function was perfect in all the cases, extension was normal, but there was distinct limitation of flexion in all." Of 14 between fifty-five and sixty-four years, "function was perfect in 4 only, 5 had practically a stiff joint, and flexion and extension were limited in all."

*Average Period of Incapacity*

Bardenheuer in his series (149) of ankle fractures noted that 77·2 had recovered under ninety-one days. Of these, 20 were

over fifty years of age, 10 of them had fractured both bones, nevertheless 19 out of the 20 had become fit for work.

Forgue and Jeanbrau in cases of fracture by *adduction* place the average duration of incapacity at from one and a half to two months, and the same in fractures by *abduction* at five months.

Imbert regards these figures as too low and, judging from his own cases, gives the average time necessary for consolidation—in fractures of the *internal malleolus*—at four months, and of the *external malleolus* at six, eight, nine, or even ten months.

We now append from the Fracture Committee's Report a table giving the average duration of incapacity in Pott's fracture treated by conservative as opposed to operative methods:

*Average Duration of Incapacity*

| Age. | Site of Injury. | Non-operative. | Immediate operation. |
|---|---|---|---|
| Under 15 years | Lower epiphysis, Pott's fracture | 22 weeks | No record |
| Over 15 years | ,, ,, ,, ,, | 23·7 weeks | 14·5 weeks |
| Permanent incapacity, over 15 years | ,, ,, ,, ,, | 6 per cent. | 25 per cent. bad results |

## Factors in Evaluation

As a prelude, *radiographic* examination is essential—otherwise slight fractures may be overlooked and persistent pains prove inexplicable.

*Displacement.*—While fractures of the malleoli involve no shortening they do entail displacement of the foot inwards or outwards, backwards or forwards. Correction thereof constitutes the chief difficulty in treatment, and when achieved retention is not easy and sometimes impossible. Displacement is not only produced at the time of fracture, but may become established subsequently, when the subject attempts to walk. These *secondary* deviations are more difficult to correct than the primary.

Of the different deviations possible, the most common and at the same time the most grave is displacement *outwards*. The sole of the foot may face directly so—the subject treading on the inner half of the sole or even on the inner border of the foot—

which of course renders walking practically impossible. Deviation *inwards* is less frequent and naturally less grave.

*Articular Complications.*—Stiffness of the *knee*, if it ensue, readily disappears, not so that of the *ankle*. For given a comminuted fracture of the malleoli or much displacement of the fragments, *ankylosis* more or less complete may ensue. In other instances pain and limitation of movement is caused by excessive callus formation and its pressure on adjacent structures.

*Deformity.*—Fractures in neighbourhood of the ankle joint leave behind them more or less enlargement, partly due to œdema and partly to *osseous hypertrophy*. *Œdema*, always present, is more marked in the graver form, i.e. Dupuytren's fracture, and reaching up to the calf it involves also the foot. Its mode of production is identical with that met with in fractures of the shaft, and here, as in the leg, a rough parallelism obtains between the degree of œdema and the pains.

*Pains* in fractures of this region are often pronounced, not only at site of lesion, but radiating thence up to knee and hip. While more severe in badly consolidated fractures, they occur also in those with good union, and rarefying osteitis appears in some to be the only assignable cause.

*Muscular Wasting.*—Always present, it is not so pronounced as in fractures of the shaft, but if well marked must be taken into consideration in the assessment.

### *Assessment*

While some fractures in this region unite rapidly in good position, leaving little or no incapacity, others, such as Dupuytren's variety, may be followed by functional disabilities equivalent in degree to that of loss of the leg. At the same time, even in instances of marked deformity, an astonishing measure of adaptation thereto ensues, which diminishes appreciably the functional disablement.

Chaput in his work on *malleolar* fractures classifies the results obtained into five groups :

(1) *Excellent.*—Cases in which there is complete functional recovery without pains.

(2) *Satisfactory.*—Cases in which the functional incapacity is minimal—viz. does not exceed 3 to 10 per cent.

(3) *Mediocre.*—Cases marked by pains, limitation of mobility, muscular wasting, and slight displacement, i.e. the subject walks, but in a halting fashion and with pain—the resultant incapacity ranging from 10 to 30 per cent.

(4) *Unsatisfactory.*—Cases with displacement of foot outwards

and almost complete ankylosis. Walking is seriously compromised and the incapacity reaches 30 to 40 per cent.

(5) *Very Unsatisfactory.*—Cases marked by pronounced deviation outwards, the foot being in a position of equinus. In such cases operation is imperative. Subjects are more incapacitated than if the leg had been amputated. The resulting disablement equals 50 to 60 per cent. or more.

Out of Chaput's series of 31 examples he classified the results in 8 as excellent, in 4 satisfactory, 9 mediocre, and 10 unsatisfactory or very unsatisfactory.

The above observer's differentiation of the varying grades of disability appears to us very practical and his evaluation of the same correspondingly appropriate, but for the sake of completeness we will quote also the figures cited in the French " Guide Barème " for similar lesions :

*Fractures of the Lower Extremity of Tibia and Fibula*

| | |
|---|---|
| (*a*) Of both malleoli . . . . . | 30 per cent. |
| (*b*) Internal malleolus . . . . . | 10–20 „ |
| (*c*) External malleolus. . . . . | 25 „ |

*Vicious Callus in Malleolar Fracture*

| | |
|---|---|
| (*a*) Displacement inwards—sole of foot facing its fellow, the subject walking and standing on external border of foot . . . | 30 per cent. |
| (*b*) Displacement outwards—sole of foot facing outwards, subject in standing or walking resting on inner half of sole or inner margin of foot . . . . . | 50 „ |

## Fractures of the Tarsal Bones

These are usually the result of extreme violence—a fall on the feet from a height or the passage of a heavy object over the foot. The bones most likely to be fractured are the os calcis and the astragalus—the former commonly.

### Os Calcis

Three forms are recognized : (1) comminution of the body ; and fracture of (2) the posterior half with insertion of tendo Achillis ; and (3) sustentaculum tali.

In the first form coaptation of the fragments is as a rule impossible of attainment, and even surgical measures aim, not at

reposition of the fragments, but at their ablation. In the second variety operation and fixation will give the best results. As for the third it generally entails eversion and sinking of the plantar arch.

*Average Period of Incapacity*

According to Phillip Turner some degree of permanent disability is most likely to result. The subject may be allowed to walk at the end of eight weeks, but the plantar arch requires support for another month.

Turning to Cabot and Binney's statistics of twenty-six cases, the average duration of disability was about six months. Forgue and Jeanbrau put the average duration of incapacity at from three to four months. Imbert, taking twelve cases of fractures of the foot as a whole, places it at from six to eight months.

## Astragalus

The fracture may occur without any displacement, but if the line of cleavage is through the neck of the bone the foot undergoes deviation—carrying with it the small fragment. If *comminuted*, the fragments may be so widely displaced that any hope of anatomical reduction is illusory, and operation and ablation of the fragments offer the best hope of a satisfactory result.

*Average Period of Incapacity*

Cabot and Binney, cited by Gayet, give the following figures:

| | | | |
|---|---|---|---|
| Temporary incapacity | 6 months | . | 1 case |
| ,, ,, | 6–12 ,, | . | 2 cases |
| ,, ,, | 1–1½ years | . | 2 cases |
| ,, ,, | 1½–2 ,, | . | 1 case |
| ,, ,, | above 2 ,, | . | 3 cases |

## Other Tarsal Bones

Fracture of the *cuboid* is rare and is liable to be followed by a *functional* form of valgus, which disappears with cessation of the associated pains. Though the fracture is usually comminuted, great displacement of fragments does not as a rule occur, and the *functional* results are likely to be good.

Fracture of the *scaphoid* is relatively common. The fragments are difficult to replace and retain *in situ*, and in case of failure their ablation is indicated. Avulsion of the tubercle of the scaphoid is occasionally the result of violent effort.

Fracture of the *cuneiform* bones is usually the result of a crush, and so is frequently associated with damage to other structures. As in fracture of the *scaphoid*, there is great liability to a condition of *traumatic flat-foot* supervening as a sequel to this injury.

### Factors in Evaluation

Collectively regarded the factors that dominate evaluation of fractures of the tarsal bones are displacement of the foot, ankyloses, muscular atrophy, persistent pain, and traumatic flat-foot.

*Os Calcis.*—Shortening, muscular atrophy, and persistent pains are common. *Ankylosis*, too, is apt to ensue. Flexion and extension are but little restricted, but the movements of pronation and supination may be gravely compromised. In *heel* fractures the power of extending the foot upon the leg may be greatly impaired. On the whole the disability is less than in fractures of the astragalus.

*Astragalus.*—The most important factors responsible for ultimate incapacity are deviation of the foot, ankylosis, persistent pains, and muscular wasting.

The assumption of the position of *varus* is frequent, but usually does not sensibly impair the power of walking. But fracture with *subluxation of the foot* backwards usually predicates very pronounced incapacity.

That *pain* of a *persistent* character should be a feature is not astonishing when one recalls the important functional rôle played by the *astragalus* in standing, walking, etc.

Consolidation of fractures of the astragalus usually portends some restriction in the range of movement of the tibio-tarsal articulation. Nor can we overlook the fact that the neighbouring joints may be involved and that such multiple *ankyloses* augment greatly the degree of incapacity. *Muscular atrophy*, too, may be pronounced, and contributes to the functional disability.

*Other Tarsal Bones.*—The *scaphoid* being the keystone of the plantar arch, fracture thereof is but too apt to be followed by the development of a *traumatic flat-foot*—with its associated pain and disability. This same eventuality is but too likely to follow fracture of the *cuneiform* bones, which—like the scaphoid—enter into the formation of the plantar arch.

### *Assessment*

*Os Calcis.*—In evaluating fractures of this bone we should differentiate between the more severe forms marked by *comminution of the body* and the partial types or so-called heel-

fractures. Cabot and Binney's statistics show that in these latter the ultimate *functional* disability is much less than in the former variety. Thus out of seven instances the functional results in one were fair and in five good. Accordingly, in *heel fractures* treated *operatively* there should be *little or no incapacity.* Golebiewski in such rates the incapacity at 20 per cent.—a figure which appears excessive, but it is probable that his evaluations relate to cases treated *non-operatively.*

. For ourselves, assuming that extension of the ankle was diminished, the incapacity should not be rated higher than at from 5 to 10 per cent. The German assessments of this lesion range from 20 to 50 per cent., and presumably the higher figures relate to *comminuted fractures of the body.* The French " Guide Barème " rates the incapacity at from 5 to 30 per cent.

*Astragalus.*—The degree of disablement produced varies widely and is reflected in the disparity that characterizes the recorded evaluations. The " Wiener Schema " rates the incapacity at from 16 to 41 per cent., German and French jurisprudence at 20 to 25 per cent. and 3½ to 27 per cent. respectively. Golebiewski in fractures of the *body* rates the incapacity at 50 per cent., but if located in the *neck* of the astragalus at from 25 to 33 per cent. In one instance he assessed the incapacity as high as 75 per cent., and we may add that Olive and Le Meignen hold that the persistent pain and disability associated with this lesion may be such as to rank as equivalent to the *loss of a foot.*

From consideration of the above figures it will be seen that the German evaluations are far higher than the French—a difference, according to Imbert, referable to the more frequent resort of French surgeons to surgical treatment.

There is no doubt that the good results obtained in *excision of the astragalus* justify a lower rate of evaluation. Thus in 95·9 per cent. of his cases of fractured astragalus treated by excision Gayet states the subject was able to resume his occupation. But in ten cases of partial removal only one was able to return to work and even then was quickly fatigued. Having regard to the good results obtained in excision of the astragalus, and likewise the strong tendency to spontaneous amelioration of the disability produced, Imbert holds that fractures of the astragalus in general do not entail an incapacity exceeding 15 to 20 per cent.—figures, moreover, adopted by the French " Guide Barème." Nevertheless he admits that the graver cases—fortunately exceptional—call for much higher compensation.

*Scaphoid.*—Fractures of this bone may lead to great incapacity, which Golebiewski rates at from 25 to 33 per cent., German jurisprudence appraising it at a like value.

Here again, as in the *astragalus*, it is probable that with more frequent resort to *excision* better functional results will be attained and lower figures of evaluation adopted. Thus Macausland and Wood in two cases of from five to six months' standing removed the scaphoid *in toto* with good *functional* results in both. Abadie and Rauge obtained good results in three out of four cases operated upon. In eleven treated non-operatively, results in three were good, in four moderate, and in four bad.

In conclusion, the French "Guide Barème" evaluates the deformity caused by fracture of the *scaphoid* from 20 to 30 per cent. These figures are certainly not too high if a condition of *traumatic flat-foot* ensue. But, on the other hand, Imbert records that in three instances he did not consider the incapacity exceeded 10 per cent., this although one of the examples was complicated by fracture of two cuneiform bones.

*Cuboid.*—According to German jurisprudence the incapacity entailed is rated at 20 to 33 per cent., while for fractures of the *cuneiform* bones they allot 15 to 25 per cent. The French "Guide Barème," in fracture of the *cuboid and metatarsals*, rates the disability produced at 20 to 30 per cent., and the same in regard of the *cuneiform bones* at from 15 to 25 per cent. Imbert in two cases of fracture of the cuneiform bones, complicated in one by fracture of the scaphoid, in the other of the metatarsal, assessed the incapacity at 10 per cent.

*Metatarsals.*—The rates of incapacity as estimated by German jurisprudence range from 20 to 33 per cent., and those of French jurisprudence from 3 to 16 per cent. In effect the disability that ensues in fractures of the *metatarsals* is *traumatic flat-foot*—the incapacity entailed by the same being evaluated by the French "Guide Barème" at 10 per cent. Imbert in similar cases assesses the incapacity at from 5–15 per cent., the average being 8–10 per cent.

In conclusion, this figure, though it appears low, must be judged in light of the fact that the initial disability in fracture of the *metatarsals*—though of high grade—tends to diminish with time.

### Fractures of the Phalanges

These being frequently compound, their influence on industrial capacity will depend largely on whether the related joints and tendon sheaths become the seat of *infection*. If so, the resultant disability may be marked. Given *ankylosis*, the degree of incapacity produced will depend on the angle of fixation. If unfavourable it may be more advantageous to amputate the toe. If in good position a slight degree of permanent incapacity

may be entailed, not exceeding 10 to 15 per cent., and often lower.

But for further details on this question we would refer the reader to the section on "Ankyloses."

## PERIODS OF ADAPTATION AS DETERMINED BY THE GERMAN IMPERIAL INSURANCE OFFICE

### Fractures of Lower Limb

*Fracture of the Thigh.*—In a certain number of instances with shortening of 2 to 3½ cm., the resultant *adaptation* has been such as to justify reduction of the annuity down to from 10 to 20 per cent. In shortening of 4 cm., even with union of the fracture at an angle, *adaptation* has supervened to such an extent as to warrant reduction of the annuity to from 20 to 25 per cent.

*Shortening after Fracture of Thigh*

| Shortening. | Muscular atrophy. | Annuity. | Period of adaptation. |
|---|---|---|---|
| 1 cm. | 3 cm. | 0 per cent | 3 years |
| 2 cm. | 3 cm. | 0 „ | 5 „ |
| 2 cm. | 2 cm. | 0 „ | 5 „ |
| 2½ cm. | Notable | 0 „ | — |
| 3½ cm. | 2 cm. | 0 „ (2 cases) | 15 and 22 years |
| 5–6 cm. | — | 0 „ | 14 years |

*Fractures of the Leg.*—The Imperial Office are of opinion that these usually heal without leaving lasting functional disablement. This even despite the fact that after the passage of a few years there still remains slight wasting of the calf or limitation of the movements of the ankle. Even when troublesome symptoms do persist, *adaptation* is held to be realized after a certain number of years, and the annuities have almost always been lowered. We here introduce a table from the same source showing the periods required for adaptation in fractures of the leg marked by *shortening*, but not accompanied by any other symptoms militating against industrial capacity:

*Shortening after Fracture of the Leg*

| Shortening | Occupation | Period of adaptation |
|---|---|---|
| 2 cm. | Labourer | 11 years |
| 2 cm. | Agriculturist | 2 „ |
| 2 cm. with deviation | Agriculturist | 8½ „ |
| 2½ cm. | Labourer | 3 „ |
| 1½ cm. | Agriculturist | 5 „ |
| 1½ cm. | Labourer | 6 „ |
| 1 cm. with deviation | Agriculturist | 13 „ |
| 2 cm. with prominence of upper fragment | Agriculturist (woodman) | 5½ „ |
| 3 cm. | Agriculturist | 8½ „ |

It is interesting to note that the Imperial Office, in fractures of the leg marked by union of the fragments and stiffness of the foot, take up the following attitude. Relying on expert opinion they do not hesitate after a certain lapse of time to abolish the annuity. They cite the case of an agricultural labourer, the victim of a fracture of the leg with slight deviation of the axis of the limb and shortening of 3 cm. The unfortunate man's annuity was abolished after eight years. This although he complained of pains in the leg when exposed to changes of weather or following violent exertion. The tribunal, however, held that only injuries which influenced the victim's *economic* value justified the grant of an annuity, but not the bodily inconveniences he complained of.

*Fracture of Malleoli.*—Complete *adaptation* in these cases is held to be realized at the end of two or three years, and even in instances marked by persistent atrophy of the calf and more or less restricted mobility of the ankle, it was held that after a variable interval adaptation was partially achieved and a corresponding reduction in the annuity justified.

They cite the following interesting instances :

(1) Fracture of the *left malleolus* with persistent marked outward deviation of the foot, sinking of the plantar arch, stiffness of ankle, and atrophy of the calf. After allowing two years for adaptation the annuity was lowered to 25 per cent.

(2) A working jeweller sustained a *fracture of the malleolus* and *one metatarsal* on the right side, as a consequence talipes equino-varus developed, with marked wasting of the calf (6 cm.) and pronounced lameness. After four and a half years the annuity was lowered to 40 per cent.

The experience of the authorities in these fractures supports the generally accepted view that the *functional end-results* obtained are much superior to similar lesions of the tarsus.

*Fractures of the Tarsus.*—The *functional end-results* obtained in fractures of the tarsus as indicated above are relatively unsatisfactory. Given good union, with slight muscular weakness of the leg, the authorities have felt justified in abolishing the annuity after four years.

Still, the period required for accommodation to the residual functional disabilities ensuing after more *severe* tarsal fractures far exceeds the time cited.

(1) *Fracture of Right Tarsus.*—Definite limitation of movements of foot, with typical pes valgus. Atrophy of muscles of thigh, 1 cm.; and of those of the calf, $2\frac{1}{2}$ cm. Complete adaptation after six years.

(2) *Fracture of Right Tarsus.*—Limitation of range of rotation of foot by one-third. Wasting of calf muscles, 1 cm. After thirteen years, while the objective state remained unchanged, a certain measure of adaptation was achieved—sufficient to justify reduction of the annuity to 10 per cent.

(3) *Fracture of Left Tarsus.*—No limitation of flexion and extension of ankle, but range of rotation of foot was reduced by two-thirds. Wasting of calf muscles, 3 cm., but their functional efficiency was equal to that enjoyed by the same group of muscles in the opposite and uninjured leg. Complete adaptation after fifteen years.

(4) *Fracture of Calcaneum in Both Feet.*—Residual enlargement of both bones. Double pes valgus. Movements of ankle joint normal, but rotation of foot limited to two-thirds. Slight wasting of calf muscles in both legs. At the end of six years the previous annuity of 10 per cent. was increased to 30 per cent. owing to the fact that the pains experienced in both feet had undergone aggravation.

(5) *Fractures of Astragalus and Calcaneum of Both Feet.*—Enlargement of os calcis on both sides. Double pes valgus. Rotation of foot limited to one-third. Slight limping. The exact period required for adaptation is not stated, only the fact that after its accomplishment the annuity was lowered to 50 per cent.

## CHAPTER XVIII

## CICATRICES OR SCARS

Given a solution of continuity in the skin or other structure, it is by means of connective tissue that the breach is healed and the gap bridged over. But as an older writer once remarked, "Unalloyed good is not to be sought in the domain of pathological anatomy." For this same fibrous tissue—all-essential though it be for healing—carries yet its own Nemesis—*retractility*. Thus when developed in excess in the kidney it contracts and shrivels, and clasping the part in an inexorable grasp utterly destroys the organ. In like fashion the morbid process which ultimately distorts and unfits the heart-valves for their function is shrinkage of this same connective tissue. It is so also with the peritoneal bands which too often lead to strangulation, even as through retraction of the cicatrix a stricture or occlusion may follow a wound of the ureter, œsophagus, or larynx.

Some such prelude is essential if we would appreciate the pathological vagaries of cicatrices, for "connective tissue is at once an indispensable necessity and a disease, according to circumstances." Its histological elements may undergo no change, and for years it may remain in itself harmless. But not so always, as witness its destructive effect upon viscera and its occasional development into keloid and carcinoma. Nevertheless, here we are not directly concerned with the pernicious effects of fibrous hyperplasia as displayed in internal organs, but with the sequels of scar-formation in superficially placed structures and their influence on industrial capacity.

Briefly reviewed, *superficial or cutaneous scars* are prone to the following vagaries: They may prove unduly sensitive, fragile, prone to ulcerate on the slightest pretext—complications which may have a grave bearing on the working capacity. If in the neighbourhood of joints their tendency to retraction is apt to bring in its trail many functional and mechanical disabilities. Or they may exert their pernicious effects through adherence to neighbouring nerves or tendons. Lastly, keloid and epithelioma may develop in a scar, especially that of a burn, and more emphatically those following X-ray exposure, as too many victims in our own profession have exemplified.

### Factors in Evaluation

The United States Bureau of Pensions in their instructions to examining surgeons give the following guidance in regard to cicatrices:

"Scars should be fully described, and a statement made as to whether they are tender, adherent, or dragging. If there is loss of tissue or atrophy give comparative measurements."

In these succinct instructions are embodied the chief eventualities which in the case of scars *may react unfavourably on the earning capacity*. In any given case, therefore, that comes up for appraisement we should ask ourselves the following questions:

(1) *Is the Scar Tender?*—Tenderness in scars depends very intimately on their *location*. If we recall that even normal scars —for variable periods—remain tender to touch, we see that their location in certain sites may not only militate against the normal decline of such hypersensitiveness, but may materially aggravate it. Especially true is this of a cicatrix *lying adjacent to a bone* against the unyielding surface of which it is jammed by every impact, with the result that it remains persistently tender. In regions little exposed to traumatism hypersensitiveness may be of little or no import, but not if the scar be *terminal* in site—at the *end of a finger* or in an *amputation stump*—or if located in the *palm of the hand* or *sole of the foot*. For when so placed it often occasions delay in the resumption of work, and sometimes leads to permanent incapacity.

(2) *Is the Scar Retractile?*—The *depth* and, above all, the *extent* of a cicatrix will modify profoundly its functional consequences. This because of that salient characteristic of scars or newly formed fibrous tissue—*retractility*.

The tendency to retraction is specially pronounced in scars, the outcome of *burns*—especially if *extensive and involving the whole thickness of the skin*. The granulating surface left is slow to heal, and even with the greatest care the formation of thickened hypertrophied scars and of ultimate deformities and contractures involving joints cannot always be obviated.

The vicious results of retraction are often strikingly illustrated in the case of children. Thus if the side of the chest be the seat of an extensive and deep burn, the resultant scar will eventually exert traction on the surrounding integuments—so strong and irresistible that the body of the child takes a list to the side of the lesion, and a *spinal curvature* results.

Again, the painful consequences of retraction are writ large on the marred face of the *epileptic* who, as of old, "oft falleth

into the fire." The chin may be fixed to the chest, the elbow or hip joint flexed or immobilized—even dislocation of the latter has been noted (Rendle Short).

The *functional* or *mechanical effects* of scars—as exerted through the medium of their retractility—*vary directly with their position*. This is notably so in the case of *joints*. Thus a scar on the posterior surface of the arm may occasion no inconvenience, but if it occupy the *flexure* of the elbow it may not only restrict but abolish its *mobility*.

The same is true of a cicatrix located in the flexure of the knee or the front of the wrist.

To sum up, scars situated on the *flexor* entail more serious functional or mechanical consequences than those on the extensor aspect of joints. For the newly formed scar tissue displays a vicious tendency to go on contracting—its ultimate effects being equivalent to *complete* or *incomplete ankylosis*. In view, therefore, of this grave Nemesis of scars—retractility—we see how important it is that we should not lose sight of this potentiality, especially in the case of wounds or burns in the neighbourhood of joints, the cervical or axillary regions, the fingers or other parts of mobile nature.

Burns about the axilla, elbow, wrist, hip, or knee must be treated with an eye to this eventuality—viz. the prevention of ankylosis—or if it ensue, care should be taken that the angle of fixation be a favourable one.

(3) *Is the Scar Fragile?*—The solidarity of a scar grows with time, and under the influence of exercise, ordinarily speaking, takes on the character and durability of normal skin. But if as a rule it be true that scars in the course of a few days or weeks become callous, it is well always to allot adequate time for their consolidation. For *consolidation* thereof, legally speaking, is not synonymous with mere *closure of the wound*. This latter is but apparent cure, for given too speedy resumption of work we risk the possibility of its breaking down. Accordingly, in gauging the period of temporary incapacity entailed by a wound we should take into consideration the additional time necessary for the scar's consolidation.

Some cicatrices never undergo satisfactory consolidation—that is if the wound is deep and very extensive. The newly formed epidermis then is pink, prone to wrinkle and break down under slight traumatisms. In short, the scar is not durable—unfit, in fact, to withstand the exigencies of work. Extremely friable scars are often met with in *varicose ulcers*. It is difficult in such to estimate how far trauma is responsible for their breaking down, for the skin seems utterly unable to withstand the unavoid-

able stresses, strains, or slight shocks inevitable in a workaday life. Few will dispute that here the rôle of trauma is subsidiary, and that the true flaw is the *undue vulnerability* of the tissues. In short, the fragility of the cicatrices is such as to be incompatible with ordinary work.

(4) *Is the Scar Extensile?*—Linear cicatrices—the result of healing by first intention—are rarely causes of permanent incapacity. In this they contrast with wounds which heal more tardily, their course chequered by suppuration. Still, certain individuals scars—*even linear*—tend after a time to widen.

This giving or stretching, if the scar be located at certain sites in the *limbs*, may be a blessing in disguise, making for more suppleness or freedom of mobility in the related joints.

On the contrary, linear cicatrices in the *abdominal or chest wall*, if they undergo widening under the influence of intra-thoracic or intra-abdominal pressure, may lead to *protrusion of the abdominal or thoracic contents*. It is for this reason that sometimes after radical cures—even when skilfully performed—a hernia reappears.

(5) *Is the Scar Adherent?*—The adherence of a scar to underlying structures, e.g. the brain or lung, may gravely compromise industrial capacity. The same may ensue if the scar involves *nerves*, *muscles*, or *tendons*, e.g. in the wrist or the hand. In such a case—if a nerve be involved—the scar may be painful, the seat of subjective neuralgia or objective tenderness. In the former instance the persistent pain may be due to a *neuroma* which extirpation alone may relieve. In the latter—viz. objective tenderness—much will depend on the situation thereof. For example, it would be of serious import in an *amputation stump*, especially in the lower limb.

The evil effects of adhesion of a scar to underlying *muscles* or *tendons* is best exemplified in the *hand and fingers*. We are perhaps rather apt to overlook the important rôle played by *healthy connective tissue* in contributing to the ease and smoothness with which the integral parts of the hand achieve their varied movements. This is at once apparent when we reflect that in this region as elsewhere the connective tissue is all-pervading—filling up interstices and binding the various structures one to the other. True its rôle may be only passive, but nevertheless all-essential, as soon becomes obvious if it take on morbid characters. Normal connective tissue is extremely supple, adapting itself to all movements. But if it undergo inflammatory change this suppleness is exchanged for rigidity. It is still connective tissue, but with a difference—it is *cicatricial connective tissue*. The transformation—always of evil import—is never

more so than when it attacks the hand and fingers. For straightway its multiple tendons and articulations are compromised, their power of smooth and effective action hampered or abolished. How frequently this is exemplified in *palmar suppuration* with sequential matting of the tendons, and associated restriction of mobility in the fingers.

Take another example, the *interphalangeal joints*, above all, are liable to wounds or injuries, and how often in sequence thereto do the periarticular structures and ligaments become implicated, and the mobility of the joints compromised. Nor must we overlook the *remote consequences*, for but too often the related skin slowly undergoes atrophic changes, becomes pale and glossy, while the normal wrinkles of the dorsal surface of the joints are effaced. Nor is this all, for the morbid process tends to progress, and with it is associated pain radiating far afield, and oftentimes trophic ulceration. Needless to say, with this progressive sclerosis the functions of the hand may undergo partial or even complete suppression and the incapacity entailed correspondingly marked.

### Scars from an Æsthetic Aspect

The Compensation Laws, it is true, concern themselves not with æsthetic considerations. Nevertheless they cannot wholly be dissociated from our estimate of the consequences of a wound. Thus a *facial* scar may involve no depreciation in working capacity, but it may constitute a very real obstacle to the obtaining of work by the subject thereof. If grotesquely scarred, ill-natured ridicule or ill-concealed repulsion evinced by his comrades may discourage the more sensitive individual. Or it may be the employer who fights shy of the victim—especially if a woman—and this not wholly without reason. For "a comely face is a sign of recommendation," and if engaged in a shop a disfigured countenance may, if it does not actually repel, at least fail to attract the customer. Again, when we turn to "the purple testament of bleeding war," how all too often the fateful missile leaves behind a hideous facial blemish. Though "a scar nobly got" it yet exacts a terrible toll. Such in the case of a professional man, a chaplain, doctor, barrister, and so forth, may well blast a career bright with promise.

Simple scars, the outcome of healing by first intention, may be negligible, and others—even more extensive—may fortunately lack the repugnant character which marks some blemishes. In wounds of the *nose* the resulting cicatrization *may occlude or lay bare* its recesses—an unsightly chasm. Scars which by their retraction *occlude one or both nostrils* are obviously less deforming,

though one has to take count of the possible difficulties occasioned in respiration.

Scars involving *the mouth* and giving rise to eversion of the lips may be very repulsive, especially if the subject *tends to slaver.* Narrowing of the orifice through scarring may as a rule be corrected by operation. If a cicatrix involve not only the gum, but the cheek, it may lead to *obliteration of the gingivo-labial sac.* The latter is essential for free movement of the jaws, and consequently such a lesion may lead to *spurious ankylosis.*

### *Assessment*

The functional disabilities caused by scars may be due to any one of the eventualities just described—tenderness, retractility, etc.

Of these the most difficult to appraise are those in which the cicatrix is held to be the seat of *pain or tenderness.* This for the obvious reason that such complaints may be *simulated.* In such a dilemma the character of the scar may afford us some help. If, as is often the case, tenderness be alleged of an injured digit or one which has been amputated, attention should be paid to the following points:

Scars produced by operation are, as a rule, better placed than those the result of accident.

If the scar be situated on the *dorsum* of the finger, the complaint of tenderness would be less plausible than if it were located on the *palmar surface* or *the end of the finger*—a site at which it is more exposed to injuries. A scar, too, is more likely to be sensitive if it be *thin, adherent to the bone,* as so often happens in the case of a *conical amputation stump.*

In doubtful cases, in the last resort we must have recourse to *direct tests* to establish the reality or not of the alleged pain or tenderness.

If it can be verified, then our assessment must be based on the degree to which the *functional efficiency of the hand is depreciated.* This will depend on the *identity* of the digit or if *one or more are involved.*

If the sensitiveness is such as to put out of action the implicated digit or digits, then the assessment, temporarily at any rate, must be equivalent to that awarded for *loss of the involved finger or fingers.* (*Vide* chapter on "Amputations and Disarticulations.")

*Retractility* in a scar, through the medium of its functional mechanical effects, frequently calls for assessment.

*Scars in the neck* derive importance from the fact that the mobility of the cervical column may be compromised, and

vicious attitudes promoted. If on the anterior surface they may so flex the neck that the chin touches the sternum. If located more to the side of the neck an *acquired torticollis* may result, or in aggravated cases the ear may be bent down to touch the shoulder. In such event the victim is gravely handicapped, as *mobility of the neck is essential for most types of employment.* Moreover, his aptitude for manual or other work is hampered by *displacement of the field of vision.*

Imbert and Chavernac, who have considered scars most exhaustively from the point of view of industrial capacity, are of opinion that persons thus afflicted deserve a comparatively high indemnity. They rate the incapacity entailed at or about 30 per cent.

*Facial Scars.*—Retraction of a scar involving the nose may lead to occlusion of one or both nostrils. The sealing of one orifice may call for but a trivial indemnity, not so if *both* are involved. Because in the latter instance the obstruction to respiration may more or less lower the working capacity. Still, such assessments as have been made have not erred on the side of generosity. The Tribunal at Nancy, in a case in which there was a slight hindrance to the passage of air through *one* nostril, assessed at 0 the depreciation in industrial capacity, but the President of the Seine Tribunal, revising the decision, rated it at 3 per cent.

Even in cases in which *both* nostrils were more or less occluded, the French Tribunals have only gauged the depreciation at 4 per cent., which, as Imbert remarks, is too low, suggesting, as more equitable, 10 per cent. Still, it must be recollected that in these instances it may be difficult to establish the alleged depreciation in working capacity.

Again, from the point of view of *deformity*, cicatrices which *occlude* are less hideous than those that lay open the nasal cavities. In the latter instance, it is true, much can be done by plastic surgery, which has now reached such a pitch of excellence. Nevertheless, when such surgical intervention is impossible or abates but little the deformity, it should be accorded a relatively high indemnity—this by reason of the fact that it renders work difficult to obtain. For ourselves we would suggest in such a case that the evaluation should range from 30–40 per cent.

*Continental Estimates in Facial Cicatrices*

| Nature of lesion. | Wiener Schema. | French. | French Guide Barème. | |
|---|---|---|---|---|
| | % | % | % | % |
| | | | One eye | Two eyes |
| Scars of eyelids: entropion | — | 5–15 | 10–20 | 20–50 |
| „ „ ectropion | — | 15–25 | — | — |
| „ „ lachrymal duct (epiphora) | — | 5–20 | 1–10 | 10–20 |
| „ „ symblepharon | — | 15–25 | 0–10 | 10–20 |
| Occlusion of one nostril | — | 0– 3 | — | |
| „ „ both nostrils | — | 4–10 | — | |
| Loss of nose | 16–25 | — | 20–30 | |
| Cicatrices of the face | 8–16 | 20 | — | |
| „ „ „ (if disfiguring) | — | 25 | — | |
| „ „ „ with retraction of nose and mouth | 33 | — | 30 | |

*Scars in Relation to Joints.*—Retraction in the neighbourhood of a joint may lead to ankylosis or restriction of mobility. Our assessment, therefore, will vary according to the angle of fixation or the arc of movement retained. We accordingly refer the reader to the chapters on "Ankyloses," though a few remarks on one or two special varieties will be apposite.

*Cicatrices of the Axilla* may lead to limitation or abolition of movement in the shoulder joint. Their influence in this direction varies with the degree to which fusion of the arm and chest wall have occurred.

In the graver forms the immobilization of the arm may be complete, more so than in true *ankylosis* of the shoulder joint. For in the latter, owing to the *mobility of the scapula*, some measure of movement is retained. But not so in cicatrices in which the arm throughout more or less of its length is adherent to the chest wall. Moreover, instances of this nature are usually the outcome of destructive wounds involving loss of muscular tissue and a high degree of secondary atrophy.

Imbert cites the case of a workman, the victim of a right axillary cicatrix which did not permit of abduction beyond 45 degrees, and was complicated by marked muscular atrophy. He rated the depreciation at 25 per cent.—an evaluation which was confirmed by a tribunal.

On the other hand, the same expert in graver forms suggests what is but clearly equitable—viz. that *the incapacity should be rated on the same par as ankylosis*—i.e. 50 per cent. He considers that Brouardel's estimate (65 per cent.) and Ollive and Le Meignen's 60 per cent. are too high, at any rate in cases in which the mobility of the hand and elbow is unimpaired.

The French "Guide Barème" rates the incapacity resulting from an adherent axillary scar at 20–50 per cent.

Cicatrices situated on the extensor or flexor aspect of the *elbow*, especially the former, may entail considerable depreciation of working capacity. For it is clear that a scar on the *extensor* aspect of a joint, if it does not admit of the arm being flexed, is tantamount in its effects to *ankylosis* of the elbow in *extension*. Fortunately cicatrices are usually situated on the *flexor* aspect, obviously the position most favourable for work—always provided the flexion is not too acute. It may, however, be so extreme that the hand is incapable of rendering any service. In this rare eventuality the incapacity entailed may exceed that incidental to cicatricial ankylosis of the *shoulder*—viz. 60 per cent. or more.

Happily these cases are not only rare, but, like cicatrices of the axilla, are usually capable of amelioration by operation. The majority of cicatricial ankyloses of the *elbow* are less pronounced, admitting of all movements from a right angle to complete flexion, and the incapacity entailed should not be rated at more than 25 per cent.

It is unnecessary for us to deal further with *ankyloses* through cicatricial retraction of the joints of the extremities, as they are fully dealt with elsewhere.

It may, however, be noted that the French "Guide Barème," in instances of adherent scar of the *elbow* entailing *extreme flexion* of the joint, rates the resultant disability at 60 per cent. In cases in which the flexion is less marked, allowing a range of movement from 90 degrees to complete flexion, the incapacity is estimated at 20 per cent. Lastly, in the *lower limb*, if the scar entails a very marked *flexion of the knee*, the resultant loss of working capacity is estimated at 60 per cent.

But a few words on *spurious ankylosis of the jaw through cicatricial obliteration of the gingivo-labial sac* seem called for. As Imbert remarks, such a disability, though it has no direct, may yet have an *indirect*, effect on industrial capacity. Thus it makes eating a difficulty—the person having to rely on fluid or semi-solid nourishment. Moreover, the time he occupies in eating is much prolonged, and his teeth too are apt to decay. In short, the sum total of these disabilities tends to undermine the general health. Imbert, therefore, in cases in which separation of the jaws is almost impossible, is of opinion that the incapacity cannot be assessed at less than 30 per cent.

*Fragility* in a scar may lower or abolish the working capacity. Thus, for example, weak or friable cicatrices in the hand or fingers are liable to *trophic ulceration* of rebellious type, and not infrequently *amputation* of the offending digit is solicited. The

assessment, of course, must be based on the degree to which the efficiency of the hand is impaired. It is clear that if a cicatrix be *ill-formed* it may readily break down in the course of work, especially if its site exposes it unduly to friction or blows. If it be a cicatrix following amputation of a phalanx, we should recollect that in this instance to the loss of the finger is added this further disability—an *inefficient scar*—and accordingly our assessment must be correspondingly elevated. This at any rate if for some reason or another the performance of a supplementary amputation at a *higher level* be contraindicated.

To sum up, in evaluating any cicatrix it should be noted whether the scar has any chance of becoming *consolidated*—basing our opinion on its site, its consistency, its adherence or not to subjacent bone, etc.

*Adherence of a scar* to underlying structures, the *brain* or the *lung*, may more or less incapacitate. But the functional disabilities that arise cannot be adequately considered save in association with lesions of the nervous or pulmonary systems, and their consideration will be postponed thereto.

In the case of *cicatrices* which have become adherent to underlying *nerves* the evaluation will depend on the identity of the nerve and the degree to which the functions it subserves are impaired. (*Vide* "Injuries to Nerves.") Similarly if a scar adhere to the sheath of a tendon and limitation of mobility result, the functional consequences must be assessed on the lines laid down in the chapter dealing with "Ankylosis and Restricted Mobility."

*The stretching or widening of scars*, with resulting protrusion of abdominal, thoracic, or cranial contents, cannot be discussed apart from consideration of lesions of these particular systems.

## CHAPTER XIX

## INJURIES TO NERVES

EVEN "grim-visaged war" hath its Compensations, for such is the natural history of calamity. The cataclysmic changes that strew its path—the endless contingencies born of its "rude, ungentle hands"—strain to the utmost our resourcefulness, our adaptive capacity. Roughly jolted out of wonted grooves—what a stimulus to Growth in all directions, and in none more so than in the domain of Healing! Glance down "the corridors of Time," and lo! it was ever so from the hoary days of Antyllus onwards. Before the scorching blast of war—that grim iconoclast—how our shibboleths, scientific and other, wither! Yet ever out of its harrowing travail is born some new illumining fact, some hard-won benison, its tardy tribute to suffering humanity.

Bethink us that it is to the American Civil War that we are indebted for that classic description of "Gunshot Wounds and other Injuries of Nerves," the work of Weir Mitchell and his coadjutors, then young assistant surgeons with the Northern Forces. In the present war, too, how great the enrichment of our knowledge of the pathology, symptomatology, and treatment of nerve injuries! Alas, it may well be so when, according to French authorities, no less than one in every five war-wounds are lesions of this nature.

### The Incidence of Nerve Injuries

As to the relative frequency of peripheral nerve lesions in the upper as opposed to the lower limb, Lieut.-Col. Purves Stewart and Captain Arthur Evans have furnished certain statistics. Out of 300 cases seen by them in one year, 172 (57·3 per cent.) were lesions of the nerves of the *upper* limb, including the brachial plexus. In the *lower* limb, 81 examples (27 per cent.) inclusive of lesions of the cauda equina were met with. Incidentally it may be observed that the above figures contrast markedly with the paucity of *cranial* nerve lesions, of which there were only 42 (14 per cent.).

*Relative Frequency of Involvement of Individual Nerves*

The following table is drawn from a work on nerve injuries and their treatment, published in 1916, by the authors above quoted :

UPPER LIMB

| | |
|---|---|
| Brachial plexus | 61 |
| Circumflex | — |
| Median | 20 |
| Ulnar | 34 |
| Musculo-spiral | 36 |
| Posterior interosseous | 1 |
| Radial | 1 |
| Wrisberg | 1 |

MULTIPLE LESIONS

| | |
|---|---|
| Median and ulnar | 14 |
| Median and musculo-spiral | 5 |
| Ulnar and musculo-spiral | 2 |
| Median and radial | 1 |
| Musculo-spiral, ulnar, and musculo-cutaneous | 1 |
| Median, ulnar, and internal cutaneous | 1 |
| Median and internal cutaneous | 1 |
| Ulnar and internal cutaneous | 2 |
| | 181 |

LOWER LIMB

| | | |
|---|---|---|
| Cauda equina | | 11 |
| Lumbo sacral plexus | | 7 |
| Sciatic | trunk | 21 |
| | internal popliteal | 1 |
| | external popliteal | 26 |
| Posterior tibial | | 1 |
| Obturator | | — |
| Anterior crural | | 5 |
| Internal saphonous | | 5 |
| Musculo-cutaneous | | 2 |
| Small sciatic | | 3 |

MULTIPLE LESIONS

| | |
|---|---|
| Sciatic and anterior crural | 4 |
| Great and small sciatic | 1 |
| Obturator and anterior crural | 1 |
| | 88 |

## The Alder Hey Statistics

Captain C. B. Alexander recently stated that at the Alder Hey Military Orthopædic Hospital no less than 866 cases of nerve injury had been treated at this institution between January 1915 and December 1917. Out of the total number the lesions in

644 were complete, and in 232 of partial extent. During the period under review 474 operations upon peripheral nerves had been performed, of which 298 were sutures and 176 neurolyses.

*Relative Frequency of Involvement of Individual Nerves*

| | | | |
|---|---|---|---|
| Ulnar | 265 | or approximately | 30 per cent. |
| Median | 179 | „ | 20 „ |
| Musculo-spiral | 122 | „ | 15 „ |
| External popliteal | 90 | „ | 10 „ |
| Sciatic | 48 | „ | 6 „ |
| Brachial plexus | 36 | „ | 4 „ |
| Internal popliteal | 26 | „ | 3 „ |
| Radial | 23 | „ | 2·5 „ |
| Posterior interosseous | 22 | „ | 2·5 „ |
| Anterior tibial | 18 | „ | 2 „ |
| Posterior tibial | 17 | „ | 2 „ |
| Circumflex | 11 | „ | 1 „ |
| Musculo-cutaneous | 12 | „ | 1 „ |
| Anterior crural | 7 | „ | 1 „ |

MULTIPLE LESIONS

| | |
|---|---|
| Ulnar and median | 58 |
| Ulnar and musculo-spiral | 8 |
| Ulnar and posterior interosseous | 2 |
| Median and ulnar | 58 |
| Median and musculo-spiral | 7 |
| Median and musculo-cutaneous | 2 |

In regard to the *musculo-spiral* no statistics are given, but it is stated that " Of the large nerves of the upper limb, the musculo-spiral was least frequently associated with lesions of other nerves." As to the *cords* of the brachial plexus, the *outer and posterior* were injured more frequently than the inner—in the proportion of 4 to 1.

In the *lower limb* the great *sciatic* trunk was implicated in 48 examples, and in 25 of this series both its component parts were involved. But in 18 the external half alone was invaded, and in 5 the internal half only. As to the branches of the great sciatic, the external popliteal was alone concerned in 90 cases, and the internal in 26. It is probable, as suggested, that the exposed position of the external popliteal—as it encircles the neck of the fibula—is responsible in part for the relatively high frequency with which this branch suffers damage. Still some other factor probably intrudes, otherwise how explain why in wounds of the upper part of the thigh the external half of the sciatic suffers damage so much more frequently than the internal bundle. The frequency with which in wounds of the sciatic trunk the

paralytic symptoms are limited to the distribution of the *external* popliteal branch, is borne out also by Mouchet's statistics. According to Makins the peroneal symptoms predominate in 90 per cent., and "often when the whole nerve was implicated the popliteal signs were of the irritative (or partial), and the peroneal of the paralytic type."

## General Principles of Evaluation in Nerve Injuries

The rôle of the assessor is that of critic. For him the unwelcome task of reviewing the handiwork of his confrères—the success with which they have combated the malign effect of injury or disease; to what extent, if any, they have fallen short of ideal perfection. Called to pass sentence on the work of others, how imperative that he possess, not only profound professional knowledge, but that higher quality of mind—*Judgment.* This especially in regard to *nerve injuries*, for scarcely in the whole domain of medicine and surgery will the demand on the assessor's capacity be more exacting than in this particular sphere.

Moreover, the statistics adduced clearly indicate that the difficult task—*the evaluation of their consequences*—is one that in the future will more and more often confront the assessor.

Obviously an essential part of his equipment will be *diagnostic* acumen, coupled with a profound knowledge, moreover, of the elements of *prognosis* in nerve lesions. To these must be added also the ability to appraise, not only the physiological, but the *economic* significance of injuries of this nature. Called upon as he will be to adjudicate thereon at any stage of their life history, he must be capable of forecasting their probable evolution—their ultimate effect on the victim's working powers.

### The Elements of Prognosis

Many and diverse are the factors that must be passed in review if we would attempt to cast the clinical horoscope of nerve injuries—their functional end-results, their influence on industrial capacity.

The data, all important, culled from an exhaustive examination of the case, when up for evaluation, must—to appreciate their true significance—be envisaged in light of its previous history; this *ab initio.* This certainly if we are to escape that *bête noire* of all assessments—*lack of discrimination*—with its baneful correlate—evaluation of incapacities after an unintelligent routine fashion. This irrational method of assessment

would not be tolerated in such cases if up for judgment in civil courts, and despite the restrictions that hamper the expert in grading pensions for like injuries, he should nevertheless, within the limits prescribed, endeavour to exercise this same discrimination.

To achieve his purpose the assessor must take a catholic view of the case. He must, in regard to the lesion itself, recall (1) its mode of production; (2) its nature; (3) its severity; (4) its complication or not by associated lesions; and (5) the method of treatment adopted. Nor is this all, for he must be familiar with (6) the indications for *operative* intervention; (7) the signs of regeneration, whether *spurious* or *genuine*; and (8) the proofs of cure.

But brief reflection suffices to show that all these varied considerations are wholly pertinent to the assessor's task. Thus, to begin with, how—save after eliciting and pondering these various factors—can he formulate a measured estimate as to whether the *evolution* of the nerve syndrome has been such as might be expected or in what respect and to what circumstance may be referred its *aberrant course*.

His, again, to decide whether the case is or is not ripe for *final* assessment. Has the symptom complex reached its terminal condition, or is the essaying of evaluation *premature*? Are there present signs—though haply previously unrecognized—of *impending recovery*? If so, its assessment must be postponed, otherwise the man's disability will be assessed too highly, the State suffer imposition.

But note how meticulously careful the assessor need be! The tokens of recuperation may be *spurious* and not genuine. *Functional adaptation*—that *fidus Achates* in all disablements—may be coming into play, confounding the issue. In other words, the *substitution*, more or less, of the functions in abeyance by *auxiliary* or *antagonist* muscles may blind us to the still persisting inertia of the *paralysed* group.

Yet another possibility presents itself. Conservatively treated, the case is *stationary*, displaying no harbingers of revival. Now here is demanded of the expert familiarity with the normal evolution of nerve injuries—the *period of time* that, generally speaking, should be suffered to elapse before committing himself to any decision as to whether or not an exploratory operation should be undertaken. It may be release of the nerve from *compression* by scar tissue or callus that is called for, or in *complete section* with loss of substance a *nerve graft* or *nerve anastomosis*. Or, lastly, in *irremediable paralysis*—complete or residual—it may be *tendon transplantation*, *tendon fixation*, or *arthrodesis* that

clamours for performance. All these have in them potentialities of amelioration, and obviously the assessor should be familiar with the conditions indicative of their adoption. This for the salient reason that when successful they reduce the *measure of industrial incapacity* occasioned by the original lesion. Moreover, resort to any of these procedures necessitates the postponement of final assessment. Lastly, no consideration of the expert's rôle would be adequate if it failed to take cognizance of his *diagnostic* responsibilities.

The clinical picture in war injuries is often blurred through the presence of associated lesions of *bones*, *muscles*, or *vessels*. Apart from this, too, neural lesions may be simulated by *joint ankyloses*, *vicious contractures*, or *painful cicatrices*. The retraction and adherence of *tendons* to neighbouring parts may to the unwary also be a pitfall; while confusion of *organic* nerve lesions with those of *psychogenic* or *hysterical* nature is all too easy. The surest defence against such fallacies is careful physical examination, special care being taken to note *objective* modifications affirmatory of nerve lesions—viz. lack of muscle tonus, alteration of reflexes, electrical changes, and trophic phenomena.

These preliminary animadversions make clear the intricacy of the assessor's task—the full elucidation of which demands still more extended consideration under the headings before outlined.

### (1) Mode of Production

The ætiology of a nerve lesion—its manner of causation—has an intimate bearing on *prognosis*, which factor, as always, must enter perforce into the process of *evaluation*.

Was the injury *subcutaneous*; if so, was it due to traction or pressure? For, as a rule, in subcutaneous injuries the outlook is much more favourable than in cases of *direct* injury with one exception—*traction* injuries of the brachial plexus.

Was it due to *pressure*—long-continued or sudden? Recovery, both motor and sensory, may be confidently expected if the muscles do not give the reaction of degeneration. Sherren says: "Restoration of sensibility to all forms of stimulation is perfect usually within six to four months."

Was it due to *concussion*? In wounds by bullets or shell fragments damage may be occasioned *indirectly* by the velocity of the missile with concurrent transmission of its vibration to the nerve substance. In this manner, concussion or contusion thereof, sometimes both, or hæmorrhage into the nerve trunk may ensue. Subjected to such violence a *physiological* nerve block ensues—happily ephemeral in duration. Tubby, on this

form of lesion, observes that its salient distinction is "the early return of voluntary movement in muscles which at the outset were wholly paralysed."

Was it due to *direct violence*? The peripheral nerves may in this way suffer *complete* or *partial* severance. Such, in warfare, may be the outcome of bayonet or sword thrusts, more commonly the direct impact of a bullet or shell fragment. The forecast will differ as to whether *infection* be present or not. If the former, the outlook is much more sombre, and unfortunately in war injuries sepsis is nearly always present.

The ideal operative procedure in nerve injuries—viz. *primary nerve suture*—cannot therefore be undertaken. It must be postponed till suppuration has ceased. Even when the primary wound has healed too, especially in cases complicated by fracture, an unexpected recrudescence of latent infection may ensue. The enforced delay brings its Nemesis in the shape of excessive scar tissue, that bugbear of *secondary* nerve suture. The assessor, bearing in mind how seldom in war wounds do we secure the ideal conditions—primary suture and asepsis—will recognize that the prognosis of nerve lesions in war injuries is much more unfavourable than those transpiring in *civil* life.

### (2) The Nature of the Lesion

Unfortunately, to distinguish clinically between *complete anatomical* and *physiological* severance transcends our present powers of differentiation. This inasmuch as the conductivity of the nerve alike in both instances is abolished. It follows, therefore, that the *functional* manifestations in both instances are identical. In other words, only through exposure of the nerve, either in the wound or designedly by operation, can we determine anatomical section from physiological block. As Professor Pitres observes: "It is possible to diagnose physiological interruption of a nerve, but it is impossible to diagnose its *anatomical* section." None will deny that our disability in this respect is a serious handicap. Were it possible to diagnose *anatomical* division of a nerve at the *time of injury* immediate suture could be performed—the chances of success correspondingly enhanced. Happily our diagnostic limitations in this sphere do not seriously incommode the assessor. He is concerned alone with the *functional* effects of the injury, and these being identical both in anatomical and physiological lesions, he is still in a position to draw the necessary inferences that constitute the basis of his evaluation.

*The Syndrome of Complete Interruption*

Both in complete anatomical section or physiological block, the motor and sensory changes found *below the level of the lesion* are as follows :

(1) Paralysis of all muscles and loss of their tonicity.

(2) Wasting of the related muscles.

(3) Reaction of degeneration in the same (*vide* later section).

(4) Abolition of the related tendon reflexes.

(5) Absence of tenderness of the nerve trunk below the lesion.

(6) Anæsthesia—permanent and sharply delimited—of the area of skin supply.

(7) Absence of tenderness on pressure in all the muscles below the lesion supplied by the injured nerve.

No one of these phenomena taken individually is diagnostic. It is their *coexistence* that furnishes proof of complete interruption. Nor is the diagnosis reinforced or the reverse by the existence or not of *spontaneous pain* and *trophic* and *vaso-motor* disturbances. For these in their manifestations are variable, and in no way *characteristic*.

*Signs suggestive of Incomplete Interruption*

The presumption that an anatomical section is incomplete, or a physiological interruption not absolute, is rendered probable given the following features :

In the *motor* sphere such would be indicated if instead of absolute paralysis there were merely *paresis* of some or all the muscles below the lesion supplied by the nerve. Indeed, complete loss of power may obtain in some particular group of muscles supplied by the nerve. Such we see in *fascicular* lesions of the ulnar nerve in axillary wounds—viz. *paresis* of the ulnar flexor of the wrist and deep flexor of the digits with *absolute paralysis* of those intrinsic muscles of the hand innervated thereby. Atrophy of course ensues, more marked in the paralysed as opposed to the paretic muscles. Again, the nature of the *electrical response* is suggestive, this being that of *partial* degeneration.

In the *sensory* sphere, the differences observed chiefly obtain in regard to the *degree* and *extent* of the alteration. Thus the loss in *epicritic* sensibility is not total, neither does it extend over an area equivalent to that seen in a complete lesion. In other words, it partakes of a diminution in sensibility as evidenced by uncertain localization of light touches and a diminished capacity of differentiating contiguous stimuli as distinct, e.g. the points of a compass. Similar inferences as to the incompleteness of the

lesion would be permissible if the disturbances of *protopathic* sensibility fell short in *degree and extent* of those exhibited in complete lesions. Thus, for example, if instead of an algesia we meet with a *hypalgesia* within the area of nerve supply.

Additional features would be the occurrence of *radiating pains* and sensory perversions in the area of distribution of the nerve, as likewise the production of *tenderness* and *paræsthesiæ* following pressure on the same. A symptom, too, very suggestive of partial lesions is the not infrequent incidence of a definite *causalgia*. While to these must be superadded secretory vaso-motor and trophic phenomena which as a rule are so much more marked in these than in *complete* nerve lesions.

### (3) The Severity of the Lesion

The gravity of the lesion, and no less the character of its prognosis, largely depend on the nature of the *electrical reactions elicited*. Moreover, these latter are of paramount importance to the assessor, inasmuch as they constitute the most reliable basis wherewith he may gauge, not only the *measure* of the resultant incapacity, but its *duration*, whether permanent or temporary.

It is, of course, the *reaction of degeneration*—its exhibition or not in complete form—that is the salient point at issue. It may be *total* or *partial*. If the former, it predicates destruction of the lower motor neuron. It portends *total* and *often incurable* paralysis. Nevertheless, one must not be rash in assuming such incurability—a conclusion only permissible after a reasonable period and an indefatigable prosecution of all modes of therapy. The reaction of degeneration is met with in *complete* sections of the nerve, and also in many cases of *compression* thereof.

The *partial* reaction of degeneration is met with in cases in which the lower motor neuron is the seat of *irritation* or *compression*. The *prognosis* in such is brighter—the paralysis is *partial*, and *cure*, if not certain, is at least very probable.

Such, in brief, are the prognostic inferences to be drawn from electrical reactions. But in view of their prime importance to the assessor for purposes of evaluation, a few more practical suggestions will not be redundant. Let us suppose that we are confronted with a case of a nerve lesion and wish to elicit exact information as to the actual condition and outlook of the affiliated muscles. Now, especially in war injuries, a considerable period of time may have elapsed since the alleged trauma, and the *circumstances of origin* may be difficult to establish. Consequently we have to be alive to the fact that the victim, though unwittingly, may wrongly attribute his paralytic symptoms to

*direct* injury of the nerve, though it may in truth be a *psychogenic* or *hysterical* manifestation. This presumption will be permissible if the muscles are found to react to faradism or to the lowest capacity of a condenser (·025 microfarad). Such will be evidence of no material change in the nerve. The loss of power, therefore, may be assumed to be *functional* or due to *disuse*, and with appropriate treatment recovery will soon ensue.

On the contrary, we may infer that degeneration of the nerve has set in if there be (1) inexcitability of the nerve to *both faradism and galvanism*, as well as (2) inexcitability of the muscle to *faradism*, with increased galvanic excitability of the same, and *sluggish contraction*.

We should take a graver view of the severity of the lesion and the remoteness of its recovery if subsequent examinations disclose these still more sombre evidences—viz. *galvanic hypo-excitability* of the *muscles*, with persistence of *sluggish contraction*, and greater intensity of the "longitudinal reaction" as compared with the response elicited at the *motor* point.

Of evil omen, too, is it if successive examinations disclose *gradually progressive diminution* passing on to complete extinction of *muscular excitability to galvanism* both at the *motor* point and in the *tendon*. Such is indicative of a grave lesion, one in all probability associated with *want of regeneration*, and the forecast is correspondingly gloomy. In addition, a *lack of response* on the part of the muscles to the highest capacities of the condenser—viz. 3 or 4 microfarads—is confirmatory evidence that degeneration has set in.

Intermediate between the foregoing slight and grave lesions lies a third group which possesses this distinction. There is a decrease in the irritability of the muscles of the affected side, the amount of current required to elicit a minimal contraction is greater than that needed to evoke a like response in those of the healthy side. In such examples *recovery is the rule, but the time required for the same is variable*. A more precise estimate of the period necessary may be elicited by recourse to the condenser test.

The *lower the capacity of the condenser* required to obtain a response on the part of the muscle, the *more rapidly will recovery ensue, and vice versa*. For practical purposes it may be said that the period required in the case of a muscle responding to hundredths of a microfarad (·016–·025) may be measured in *weeks*, while in the case of one reacting to tenths of a microfarad (0·1–0·25) *months* will probably elapse.

*Significance of Muscular Changes*

*Total paralysis* of muscles below the lesion is of more serious import than when in some there is retention of voluntary power. This dictum does not hold good in the *musculo-spiral* and *external popliteal* nerves. For in their instance *total* paralysis is the rule, and *incomplete* paralysis the exception.

On the other hand, in injury of the *median* or *ulnar* nerve total loss of power is most ominous, inasmuch as even in wounds high up in the arm *partial* or *fascicular* paralysis is not infrequently met with.

According to Purves Stewart and Evans in those cases marked by *incomplete* sensory and motor symptoms—probably due to contusion of the nerve with hæmorrhagic effusion—amelioration follows in a *month*—given ionic medication with suitable physiotherapy to the muscles.

*Muscular Atrophy*

As to this phenomenon, the quicker its evolution and the more widespread its extent, the graver its significance, with this exception—viz. that in the case of atrophy of the *interossei* and *hypothenar* muscles the lesion is not necessarily severe.

*Objective Sensory Changes*

Disturbance of these may involve both superficial and deep sensations. Should there be in the area supplied by the nerve a total *lack of response to all forms of stimuli* (touch, pain, heat and cold, pressure together with absence of osseous sensibility, sense of position, and passive movement) the *lesion is severe, and the period before recovery sets in necessarily long.* But with this exception—viz. in lesions of the *musculo-spiral* nerve—there is usually no disturbance of *deep sensibility,* though there may be slight diminution of the *vibration sense* over the phalanges of the thumb, and in very rare instances over the first metacarpal and styloid process of the radius.

On the contrary, the lesion is less severe—the prognosis correspondingly *more favourable*—in those instances in which the objective disorders of sensibility take the form of *diminished* loss of sensation to *all forms of stimuli* in the area supplied by the injured nerve.

*Thermal and Vaso-motor Disturbances*

The determination on palpation of considerable *reduction of local temperature* in the skin covering the atrophied muscles

indicates a severe lesion. But the existence of a *vascular* lesion, however, would to a great extent invalidate such an assumption. The *areas of coldness* in the *musculo-spiral, median, ulnar, sciatic, and external popliteal* nerves would be the posterior aspect of the forearm, index finger, hypothenar eminence and little finger, the calf and antero-external surface of the leg respectively. Further evidence of the severity of the lesion in the case of the sciatic nerve would be the occurrence of *congestion and swelling of the foot associated with a sense of heat objectively.*

*Relative Prognostic Value of the Foregoing Phenomena*

Undoubtedly, from the point of view of evaluation, the most important are the *electrical reactions* and *muscular wasting.* In other words, if after injury to a nerve the affiliated muscles, say, within *two months* of the injury, give a *complete* reaction of degeneration, and in addition show rapid and progressive *wasting*, it points to a severe but not necessarily incurable lesion. On the other hand, a *gradually progressive diminution*, culminating ultimately in complete extinction of galvanic excitability of the muscles both at the motor points and in the tendons, points to incurability of the lesion. Lastly, a *steady improvement* in regard to the electrical reactions and a *progressive decrease* in the muscular atrophy would point to impending recovery.

(4) Involvement of Other Structures

In this matter of assessment we have, apart from the nerve lesion, to consider injuries of other structures in close contiguity with the nerve, e.g. *osseous* and *vascular* lesions.

Moreover, in the case of these war wounds, the course of the projectile through the tissues leaves in its wake excessive cicatricial tissue, the density of which in the event of prolonged suppuration is much enhanced. Furthermore, the muscles and tendons, in the presence of sepsis, may be bound down by adhesions, or as the outcome of the original violence may have undergone partial or complete destruction.

The related joint, or even those articulations more remote, when governed by the muscles supplied by the nerves, may be completely *ankylosed.* Or failing this their range of mobility may be circumscribed, or, owing to cicatricial involvement of skin and subcutaneous structures, be viciously malposed.

The existence, too, of comminuted fractures of the neighbouring bones as well as vascular lesions will also greatly hamper direct treatment of the nerve. Any of the above complications when present, but still more so when associated, constitute very

real obstacles to the nerve's regeneration, and the prognosis in respect of complete recovery, as well as the chances of the limb's ultimate usefulness, is certainly most gravely prejudiced.

### (5) The Method of Treatment adopted

This may be operative or non-operative and expectant. Now from the assessor's point of view he may be confronted with several contingencies. The case may have been subjected to *primary* or *secondary* nerve suture, and the results achieved will differ accordingly, as likewise the *prognosis* and the *probable degree of residual incapacity*. Again, it may be that the operation, whatever its nature, has been unsuccessful, either from faulty technique, or that its success has been prejudiced by coexisting lesions in the related joints, etc. Also it may fall to his lot to determine whether such non-success is attributable to lack of reasonable care, in other words, to culpable negligence, say, failure to maintain due relaxation of the paralysed muscles. Yet again, it may be that the case treated expectantly requires operative intervention, and to discuss these various points we now pass on.

### (6) Operative Procedures

*Complete Anatomical Division.*—In this *primary* suture is the ideal to be attained. Its success will depend on perfect technique, healing by first intention, and efficient after-care. As to the last factor, in all instances, both prior and subsequent to operation, the degree of success ultimately achieved will vary with the adequacy or not of the measures taken to obviate *over-extension* of the muscle groups cut off from their nerve supply. For in all forms of lower motor neuron paralysis the one thing necessary to physiological or functional salvation is *relaxation*. An over-stretched paralysed muscle tends rapidly to undergo degeneration. Thus hampered, it cannot recover even when the nerve block is removed by operation.

Presuming all desiderata to have been obtained, what is the *outcome as regards recovery*? Perfect restoration of function is possible, but, according to Sherren, unusual. This being so, what are the factors upon which to base a prognosis? The forecast will vary according to (1) the site of the lesion, (2) the identity of the nerve, (3) the method of healing.

With regard to the first reservation, the more *remote* the lesion from the periphery, the *longer* the time necessary for full recovery, and the less likely it is to recover. As to the second, Sherren observes that in the *musculo-spiral* " complete recovery

is reached more frequently and more rapidly than in other nerves." Lastly, if *suppuration* supervenes it greatly delays recovery, markedly more so than any other factor.

*Secondary Suture.*—Here the prognosis is graver, recovery being much more tardy, while a perfect result is improbable. In estimating the chances of recovery the following factors have to be considered :

(*a*) Did the primary wound heal by first intention ?

(*b*) What is the state of the muscles, are they much wasted ?

(*c*) Do they still respond to the constant current ?

(*d*) Are the antagonist muscles contractured or relaxed ?

(*e*) Have the ligamentary structures of the related joints undergone changes ?

In regard to these various points *suppuration* is the most significant, as nothing so retards recovery. Marked muscular wasting with contracture is of evil omen, as likewise loss of galvanic excitability. Thus, e.g. if great wasting and contracture be present as in the claw hand seen after ulnar injuries, operation is futile, and the same if there be persistent lack of response to the constant current. Unlike primary, in *secondary* suture *sensory* precedes motor recovery. But the former, although it returns more speedily than after *primary* suture, is always imperfect (Sherren).

*Indications for Operation in Complete Types.*—When a case of nerve injury treated non-operatively comes up for evaluation, the assessor may be called upon to give an opinion as to whether further amelioration might be attained through *operative* intervention.

Thus in injuries of the *median* and *sciatic* nerve (more especially *painful* types) the outlook, apart from surgical intervention, is particularly gloomy. Moreover, the frequently associated retraction of the fingers and toes, and the ankylosis of the wrist and ankle—which wellnigh prohibit the use of the limb—all indicate the advisability of operative interference, and this at an early date.

Again, in cases in which—as the result of repeated examinations at intervals of a month—there be persistence or aggravation of muscular atrophy, altered electrical reactions, and complete loss of power, notwithstanding physio-therapeutic treatment, exploratory operation (provided there be no sepsis) is indicated if three months have elapsed since the date of injury.

According to Mme. Benisty, in the *musculo-spiral, external popliteal, and ulnar nerves,* operation should not be delayed at the latest beyond the *fifth* month. In the case of the *median* and *great sciatic,* operation, in her opinion, should not be postponed beyond the *fourth* month.

Finally we have to consider those examples in which at the time of the trauma there was no evidence of a nerve lesion, or only slight temporary symptoms; but, nevertheless, in which, as time goes on, there supervenes *increasing paralysis*, *progressive muscular wasting*, and *altered electrical reactions*—this despite treatment by massage, movements, and electricity. In such event we are probably confronted with a mechanical factor—gradually increasing *compression*—either by cicatricial tissue or callus. As the prognosis is otherwise unfavourable we should, to relieve the nerve, have recourse to operation.

*Incomplete Anatomical Division.*—In partial severance of a nerve the results thereof will vary according to: (1) the site of the lesion; (2) the identity of the nerve. If section take place near the offshoot of a branch it may result in total paralysis of that same. This because the fibres going to make up a branch become collected into a separate bundle just before leaving the main trunk. Thus partial section of the anterior primary division of the *fifth cervical* may lead to paralysis of the spinati and deltoid muscles. Again, incomplete *severance* of the sciatic trunk may occasion paralysis of the *external* or *internal* popliteal nerve —the component fibres of these two branches being distinct even within the trunk.

Partial section, though it may give rise to no symptoms, is generally associated with loss of conduction—viz. *physiological interruption*. This owing to transient concussion or compression of the nerve fibres, still intact, by the initial violence or effused blood. Such a physiological block, too, may supervene later through compression by scar or fibrous tissue. As to prognosis, this is favourable, Sherren observing that "if efficient treatment at the time of accident or later is carried out, recovery is usually perfect, both motor and sensory."

*Indications for Operation in Incomplete Types.*—Here, as in the more severe types of nerve lesion, it is essential that the assessor be in a position to determine whether all that can be has been done to promote functional restoration, and whether operative intervention is advisable.

According to J. Renfrew White the indications for such will reside in one or more of the following causes:

(*a*) Where an incomplete lesion remains stationary after the wound has healed soundly, and the disability remaining is serious or severe. Here again it would seem to be advisable to operate as early as possible for fear the lesion, incomplete though it be, is one in which there can be no chance of spontaneous regression and recovery.

(*b*) Where an incomplete lesion is increasing in the severity

of its clinical signs, and the disability is serious or becoming so.

(*c*) Where, after a nerve has recovered up to a certain point, some serious disability remains, either paralysis of important muscles or extensive protopathic loss in the foot or hand, or extensive epicritic loss in the hand of a skilled manual worker.

(*d*) Because of persistent pain—for example, in causalgia—or for persistent hyperæsthesia or hyperalgesia.

(*e*) In all these cases operation is all the more indicated, as it is impossible to foretell the pathological condition present; it may be combined anatomical and physiological division or severe fibrosis of a portion of the cross-section of a nerve.

### *Non-operative or Expectant Treatment*

Out of the fullness of experience both neurologists and surgeons know full well that in a large number of instances of loss of power—the outcome of peripheral nerve injury—*spontaneous recovery* occurs. As to the actual number, statistics vary. Thus Mme. Benisty states that in her experience "a very large number of nerve injuries (more than 50 per cent.) are cured spontaneously without any intervention." So impressed is she that she issues the following *caveat*, viz.: "That the neurologist and the surgeon must not forget that *very frequently injured nerves regenerate spontaneously* (about 70 per cent. according to certain statistics)." We must, however, submit that it has not fallen to our lot to meet with such favourable results apart from *surgical* intervention.

Of the cases in which success follows expectant treatment, those in which loss of power is purely *functional* constitute the majority. If submitted to appropriate therapy soon after onset they recover speedily. But the longer the interval that elapses before *psychotherapy* is instituted, the less rapid the cure. In the same manner, in those instances, probably due to concussion, in which immediately on receipt of the injury there is muscular *paresis* rather than paralysis, *normal* electrical reactions, and *temporary* loss of sensation, recovery swiftly ensues under appropriate treatment.

### *The Alder Hey Statistics in Operative and Non-operative Methods*

Out of the 474 operations upon peripheral nerves which had been performed at this institution, Captain Alexander states that he was able to trace—for a sufficiently long period—260 cases, and the results of treatment were analysed under the following headings:

*A.*—Those which were sutured.

*B.*—Those in which neurolysis was performed.

*C.*—Those in which operative interference was not thought necessary, or operation was not performed for some other reason—for example, sepsis—and which received only electrical treatment, corrective splinting, and massage.

*Class A* (sutures), forming 40 per cent. of the total, shows 14 per cent. of complete recoveries over periods varying from six months to two years; partial recoveries, 21 per cent.; and no change, 64 per cent.

*Class B* (neurolysis), forming 20 per cent. of the total, shows 14 per cent. of complete recoveries; partial recoveries, 40 per cent.; and no change, 46 per cent.

*Class C* (no operation), forming 32 per cent. of the total, shows 18 per cent. of complete recoveries; partial recoveries, 43 per cent.; and no change, 38 per cent.

By complete recovery was meant complete return of voluntary power; by partial recovery some return of voluntary power, with or without reaction to faradism, and with return of protopathic sensation.

Of the nerves of the *upper* limb which had been sutured, the ulnar showed 13 per cent. partial recoveries and 3 per cent. complete recoveries; the median, 23 per cent. partial recoveries, and 38 per cent. complete recoveries; and the musculo-spiral, 25 per cent. partial recoveries and 16 per cent. complete recoveries. When neurolysis had been performed, the ulnar showed partial recovery in 28 per cent. of cases; the median, 31 per cent. partial recoveries and 15 per cent. complete recoveries; and the musculo-spiral, 22 per cent. partial and 44 per cent. complete recoveries. In the *lower* limb the sciatic in its branches showed partial recovery after suture in 28 per cent. of cases and complete recovery in 7 per cent. Of the cases of neurolysis, 62 per cent. showed partial recovery and 14 per cent. total recovery. Of the cases which had not been operated on, 44 per cent. showed partial recovery and 5 per cent. total recovery.*

* Wounds of Nerves.—(1) Operations on nerves for war wounds have so far given relatively poor results. Partial lesions give a larger percentage of good results than total lesions. (2) The mediocrity of the results is due chiefly to operation at too late a period. (3) Operation should never be undertaken in the presence of suppuration. (4) The three principal causes of want of success in late operations on nerves are (*a*) sclerosis of the peripheral end, which must increase with lapse of time; (*b*) too wide an interval between the two ends; (*c*) the intensity and duration of suppuration. (5) Retraction of tendons, ankylosis of joints and ischæmic muscular sclerosis all tend greatly to diminish the value of the functional result. The joints ought from the first to be put in an appropriate corrective position. (6) Primary suture of the nerve, which is

### (7) Signs of Regeneration

With these, again, the assessor of course must be familiar, and this not only for clinical reasons. We allude to the fact that he must be in a position to assure himself—apart from the *subject's statements*—that the paralysed parts are regaining vitality. For refusal to admit amelioration, even when present, is not a remote possibility. Again, the signs of regeneration, when existing, are important as indicative of the stage of evolution arrived at—the eligibility or not of the case for final assessment. To grasp the true significance of these criteria of regeneration both sensory and motor, the assessor must also be alive to the many fallacies that beset their interpretation.

#### *Sensory Changes*

More accurate and more timely intimations of recovery are to be derived from the *sensory* findings than from the muscular reactions. Henry Head, to whom the profession owes so much in this sphere, states that the *revival of sensibility* manifests itself in the following order: (1) response to painful stimuli and extremes of heat and cold; (2) recovery of the sensation to light touch, and later to the finer differences of temperature and the power of tactile discrimination.

Recently, however, André Thomas and Belenki, in their investigations of nerve lesions due to war wounds, noted that long prior to the return of protopathic and epicritic sensation—as outlined by Head—certain reactions deemed by them the *earliest signs of sensory recovery* could be elicited—namely:

(1) Pain on pinching the skin within the sensory area of the injured nerve.

(2) Formication on pressure and palpation of the nerve below the site of the lesion.

(3) Pain on palpation of the nerve trunk.

(4) Pain, not only spontaneous in origin, but also provoked by massage in certain muscles, e.g. in musculo-spiral lesions at the upper insertion of the supinator longus, in the sciatic, in the calf muscles close to their origin in the popliteal space.

rendered possible by the methods now in use for the disinfection of wounds. tends considerably to improve results in respect of the frequency, the rapidity, and the degree of functional recovery. (7) Even when the operation is unsuccessful, primary suture maintains the ends of the nerves in an anatomical position which greatly facilitates later operation. (8) Functional recovery occurs slowly; it requires many months and even years, and this fact must be kept in mind in estimating the final degree of disability.—Inter-Allied Surgical Conference, November 1917.

*Changes in the Muscles*

The symptoms of regeneration in the muscles manifest themselves in the following order :

(1) Return of tonicity.

(2) Reacquisition of voluntary movement.

(3) Disappearance of the reaction of degeneration with restitution of the muscular contour.

In estimating whether the recovery of voluntary motility is genuine we should beware of wrongly interpreting the action of *antagonistic* muscles, or failing to detect the part played by *auxiliary* muscles. Thus, in associated lesions of the *median* and *ulnar* nerves, flexion of the wrist can take place through the action of the extensor ossis metacarpi pollicis. In *ulnar* paralysis, too, adduction of the thumb can be compassed by the extensor secundi internodii pollicis.

Duchenne's view that voluntary motility precedes the response of nerves and muscles to faradism has been traversed by other French authorities, who state that in a large number of cases they have observed a partial return of faradic excitability several weeks or months before the return of voluntary power. As far as we know this has not been confirmed, and it is possible that the response to faradism had never been lost.

As to the time at which volitional power may be regained in paralysed muscles, it varies with (1) the severity of the lesion, (2) the identity of the nerve, (3) the interval elapsing between the injury and the suture.

The least *severe* injuries rarely take less than six months, while in those of graver type an interval of eight to sixteen months, and even two years, very commonly elapses. The *identity* of the injured nerve is of dominating influence. Recovery in early suture of the *musculo-spiral* or *external popliteal* frequently ensues in from nine to twelve months, which in the case of the *median*, *ulnar*, and *sciatic* nerves is delayed pending the lapse of fourteen to twenty-four months.

Not only do the individual nerves differ in the rapidity and completeness with which motor recovery is regained, but they display individuality in regard to the *order* in which the muscles regain motility.

In respect of *rapidity* and *completeness* of motor regeneration the musculo-spiral nerve is the most satisfactory—this whether it follow expectant or operative treatment. Recovery also in the *external poplite l* is relatively swift, but in the *ulnar* tardy and, when achieved, incomplete. The *median* and *great sciatic* also run a protracted course, the reacquirement of

voluntary motility even after eighteen months being most imperfect.

Nevertheless, in regard to the *median*, *sciatic*, and *ulnar* nerves, even in cases not operated on, we should be hopeful of appreciable improvement with time. This even though there be great loss of motor power, provided there be signs of *sensory* recovery. Again, in cases submitted to operation, even if after twelve months no tokens of recovery have appeared, we should not necessarily view them as incurable—should not regard the condition as permanent except in a very few instances. Rather should we wait for eighteen months, or preferably two years, before arriving at such a conclusion—granting the victim meanwhile a temporary allowance subject to revision at the conclusion of the above period.

As to the *objective proofs of cure*, all-important in cases of suspected exaggeration, consideration of these may with greater advantage be deferred to the ensuing chapters.

### *Functional Adaptation by Substitution in Nerve Paralyses*

As we have in our section on "Adaptation" previously observed, if a muscle or group of muscles subserving a certain function be paralysed, a somewhat similar movement may be ultimately compassed through the agency of accessory muscles. Thus, for example, in injury to the *circumflex*, with resulting *palsy of the deltoid*, the clavicular fibres of the pectoralis major and the trapezius, acting in concert, take on in large part the rôle of the deltoid. The position, again, may be reversed—an active deltoid taking on the action of a paralysed supraspinatus muscle.

Fascinating indeed is the study of *functional adaptation* in the sphere of nerve lesions. Note how the *ulnar* comes to the aid of the paralysed *median* and through the agency of its affiliated muscles, the adductor and inner head of flexor brevis pollicis, enables spurious opposition of the thumb to be accomplished. To follow it still further, observe how a dual paralysis of the *median* and *ulnar* nerves is compensated for, though but meagrely, by the intact *musculo-spiral* nerve. Thus adduction of the thumb is vicariously brought about by the extensor longus pollicis, flexion and prehension of the fingers by the extensors of the thumb and digits, while flexion of the wrist is effected by the extensor ossis metacarpi pollicis.

From the point of view of the subject, this functional adaptation to the consequences of nerve lesions through the substituted action of auxiliary or even antagonistic muscles is, of course, most beneficent in cases of irremediable paralysis. Seeking to

cultivate this innate capacity of functional adaptation, Claude, Dumas, and Porak have invoked and systematized this factor in the treatment of ancient and irremediable paralysis—the sequel of gunshot wounds. Naturally the adaptive capacity of the individual reaches its acme in the *upper*, though some measure of the same is possible in the *lower* limb. As these authors rightly remark, it is obviously undesirable that training of crippled persons in the acquirement of these vicarious muscular adaptations should be practised in the early stages of paralysis, but only when the same has been proved *irremediable*. To this we would add a further caveat, that the assessor should not be misled by such to the end of wrongly assuming that such are genuine signs of recovery on the part of muscles still remaining inert.

We have, however, in the coming chapters, when dealing with individual nerve paralyses, indicated the methods whereby genuine and spurious signs of recuperation may be differentiated. But in doing so, we would not minimize in any way the value of these adaptive capacities. Indeed, we would cordially endorse the above authors' claim, that in irremediable palsy the victim's power in this direction should be strenuously cultivated to the end of diminishing his degree of incapacity.

In conclusion, it may be thought that we have strayed somewhat far afield in endeavouring to define the general principles of evaluation in relation to nerve injuries. But in view of the extraordinary expansion that has ensued in our knowledge of the pathology, symptomatology, treatment, and prognosis of nerve injuries, it would, we think, be somewhat ungracious to do other than approach the assessment of nerve injuries in a catholic spirit, one befitting the intricacy and importance of the subject—one more in keeping with the dictates of scientific medicine.

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# CHAPTER XX

# INJURIES TO NERVES OF THE UPPER LIMB

## Injuries of Individual Nerves

WHAT a flood of light has recently been shed on the vagaries, the eccentricities of nerves! For they, like their hosts, it would seem, have their individualities. In presence of injuries, e.g. gunshot wounds, each particular nerve reacts specifically—betrays resentment after its own peculiar fashion. Doubtless it was always so, but it was reserved for Pierre Marie and Mme. Benisty to point out this interesting phenomenon.

### *The Clinical Individuality of Nerves*

Naught in the constitution, the make-up of " mixed " nerves, would seem to suggest that they would react diversely to identical lesions. In fact, their histological identity would lead us to anticipate a dull monotony of response. But like human entities, despite their outward, their anatomical semblance, they, for some occult reason, display physiological disparities in reaction even to similar traumatic insults.

Thus briefly envisaged, of the nerves of the *upper* limb, the *musculo-spiral* responds by motor *paralysis*; the *ulnar* by atrophy and *deformity* of the hand, i.e. the griffin claw; while the specific mark of *median* injuries is *pain*, with trophic and vasomotor disturbances.

What a contrast is here afforded! Compare the musculo-spiral with the median. In the former, paralysis, and in only 5 per cent. of instances pain and paræsthesiæ; these, too, often due to associated lesions—fracture of the humerus, ankylosis of the elbow. In the latter, the median (though not invariably, for there are *painless* types), excruciating, rebellious pain—*causalgia*—and with this vasomotor and tropic changes, so rarely seen in the musculo-spiral. Yet turn to the *ulnar*, and how distinct from the twain its clinical facies, its penchant for *contracture*!

Reverting to the *lower* limb, the same clinical individuality asserts itself. Gunshot lesions of the *sciatic*, like those of the median, are essentially painful, as are those of the *internal*

popliteal. But the *external* popliteal, after the style of the musculo-spiral, is *non*-painful in type, and responds by *paralysis*.

We make no apology for this digression—the intrinsic interest of these idiosyncratic reactions of nerves more than justifies their inclusion, and moreover they form a fitting and, as we opine, a pertinent introduction to the intricate problem—the assessment of individual nerve injuries.

## Brachial Plexus

Discussing brachial plexus lesions in the present war, Purves Stewart observes that "more than half of all the peripheral nerve injuries in war belong to this group," adding that "if complete plexus is rare, partial plexus lesions are common." Wounds in the *neck* or *axilla* are usually responsible, the projectile most commonly entering through the cervical region and issuing in the supra- or infra-spinous fossa. More rarely the missile penetrates the face and emerges in the neck or axilla. In civil life, plexus lesions are usually due, not to penetrating wounds, but to *contusion*, *compression*, or *traction*—this commonly in sequence to fractures or dislocations of the shoulder, especially the subcoracoid variety.

The intrinsic complexity, the bewildering interconnexions of the constituent elements of the brachial plexus, are such that wounds thereof give rise to very varied clinical syndromes. To effect their differentiation, therefore, the physician must be familiar, not only with the anatomical distribution of the nerve roots entering into the formation of the plexus, but also with the functions of the individual muscles affiliated thereto. Such knowledge acquired, he will be enabled to determine the site of the lesion, whether located in the nerve roots, the cords, or the issuing nerves of the plexus. Injuries of the cervical plexus alone are rare, and more frequently the cords of the brachial plexus are simultaneously implicated.

From a clinical point of view the varieties of plexus paralysis may be differentiated according as to whether the resultant paralysis is *total* or *partial*. Now while—as our own experience testifies—we do meet with total types of paralysis, still in the majority of instances the palsy is localized or partial. But although in these latter less severe types the symptoms displayed are varied, their clinical manifestations approximate as a rule either to the type described by Erb or that associated with the name of Mlle. Klumpke.

### *Total Plexus Paralysis*

This serious lesion, both in military and civil life, generally ensues through *traction* on the roots of the plexus—not uncommonly in sequence to dragging on the arm when raised and abducted.

Clinically it entails *total* paralysis of all the muscles of the affected limb with the exception of those *shoulder* muscles supplied by collateral branches. Movements of the elbow, hand, and fingers are wholly lost, while the mobility of the shoulder is enfeebled and restricted. Wasting ensues in the paralysed muscles, especially those of the *hand*, these latter showing more pronounced electrical changes than those elicited in the proximal segments of the limb.

The associated *sensory* changes are most pronounced in the *hand*, though extending therefrom to a higher level on the anterior surface of the forearm and lower part of arm than on their posterior surface.

The anæsthesia, *total* in the *hand*, merges into a state of hypæsthesia in the upper levels of the limb, though it is noteworthy that the *ulnar* area for a long period remains hypæsthetic.

### *Erb's Paralysis, or Upper Arm Type*

This is due to a lesion of the *fifth* and *sixth cervical roots*. Its salient features are paralysis and wasting of the following muscles: deltoid, spinati, rhomboids, subscapularis, clavicular portion of the pectoralis major, serratus magnus, latissmus dorsi, teres major, biceps, brachialis anticus, biceps, and supinator longus. This extensive paralysis involves loss of the following movements: abduction, internal and external rotation of the arm at the shoulder joint, apposition of the shoulder blades, as in standing to attention, flexion and extension of the elbow, while the power of adducting the arm and supinating the forearm is much diminished, as likewise forcible backward depression of the arm when elevated.

Wasting ensues—most marked in the shoulder muscles and those on the front of the arm. In keeping with this localization, the deltoid, biceps, brachialis anticus, and supinator longus give the complete reaction of degeneration, but the remaining implicated muscles only a partial R.D. The associated *sensory* troubles are localized to the area of the skin supply of the fifth and sixth cervical roots—viz. the outer border of the arm, forearm, and hand.

*Klumpke's Paralysis, or Lower Arm Type*

In this variety the *eighth cervical* and *first dorsal* roots are affected. Now while in Erb's syndrome the *functions of the hand* remain intact, in this form the intrinsic muscles thereof, as also the superficial and deep flexors of the fingers, are gravely compromised. In other instances the sixth and seventh cervical roots suffer also—this entailing paralysis of the extensors of the fingers, the biceps, pronators, and flexors of the wrist.

*Muscular Atrophy* is most pronounced in the thenar and hypothenar eminences, and in the first dorsal interosseous space, while in the forearm the wasting of the epitrochlear group sharply contrasts with the retained contour of the remaining muscles of the limb. All the paralysed muscles give the complete reaction of degeneration. Among the associated phenomena are pain and sensory disturbances in the ulnar region, with ocular phenomena.

*The Evolution of Plexus Lesions*

It must be realized that the life-history of these cases varies greatly. Some recover completely while in others the muscles remain permanently paretic. Taken as a whole, however, it is well recognized that the prognosis in injuries of the brachial plexus is relatively sombre. Thus, according to Von Bruns' statistics, while in *subcutaneous* injuries of the *peripheral nerves* spontaneous recovery ensued in 66 per cent., in *plexus lesions* of a like nature only 26 per cent. underwent a like restoration. Warrington and Jones, however, noted spontaneous recovery in 30 to 40 per cent. of their plexus cases. In Winnen's series 30 per cent. recovered spontaneously, while in all the remainde some improvement ensued. Sherren, on this point, remarks that if signs of *complete* division are present, spontaneous recovery is unusual, while in cases of *incomplete* division it is apt to be imperfect. He states, too, that even after operation the prognosis is not so good as after, for example, secondary suture of the *musculo-spiral* or even of the *median* at the wrist. In Mme. Benisty's experience lesions of the brachial plexus tend as a rule to recover, either wholly or in part—often the latter.

## Factors in Evaluation

It is clear that in these cases it is of prime importance that the assessor be able to judge for himself whether or no the particular case under review is ripe for final assessment. Has the lesion, as far as the resultant disability is concerned, " reached its

final condition" ? Or, as we prefer to express it, has it reached a *stable* condition, one unlikely to improve materially or get worse ?

It is, then, we think, imperative that he be able to identify the stage in evolution arrived at when the case comes up for assessment. Is it a case of *total plexus* paralysis ? If so, it is well for him to recollect that the deltoid and the muscles of the front and back of the arm recover first, while at the end of eighteen months or two years paralysis of the intrinsic muscles of the hand alone may be present—this with or without *clawing* of the digits, most obvious in the little finger. For it is in the motor and sensory areas of the *ulnar* and *median* nerves that the *residual incapacities* resulting from total plexus paralysis will be exhibited.

Again, does the paralysis conform to the *upper arm* or Erb type ? If so, recovery of motor power may be looked for in from four to six months. Albeit long prior thereto responses to both faradism and galvanism may be elicited. The paralysed muscles recover in *serial* fashion, functional restoration ensuing first in the pectoralis major, rhomboids, teres major, and latissimus dorsi. Subsequently the brachialis anticus and biceps follow suit; and then, late in time, the deltoid, spinati, and supinator longus regain power.

Lastly, is it of the Klumpke or *lower arm* type ? Here the residual incapacities relate to those functions of the hand subserved by the *median* and *ulnar* nerves.

As to *prognosis*—an essential element in all evaluations—this, in injuries of the brachial plexus, though serious enough, must not be *exaggerated.* For some cases do recover completely. Those marked by severe *trophic* troubles, cutaneous ulceration, muscular atrophy; etc., have obviously the worst outlook. Also we have to recollect, too, that in cases of *secondary suture* the prognosis depends very much on whether the after-treatment is persistent and efficient—notably as regards the prevention of *contractures* in antagonistic muscles. Last, but not least, in these intricate cases the surest guide, not only to the existing condition of the muscles, but their outlook as regards recovery, will be the character of the *electrical reactions.*

### *Assessment*

Obviously in these grave cases the victims are for an indefinite period wholly incapacitated, and must be assessed accordingly. The assessor must, however, be careful to assure himself that no such case is *prematurely* put forward for *final* assessment. Final assessments here as elsewhere should be based on the *residual*

*incapacity*—that which remains after ample time has elapsed for the maturation of curative processes—the exhaustion of therapeutic measures. Assuming such safeguards have been taken, the evaluation of plexus palsies resolves itself into one of assessment of the residual incapacity entailed by paralysis, total or partial, of the *peripheral nerve trunks* either singly or in association. Now as these latter will be considered in detail shortly, it is unnecessary for us to dilate thereon at this juncture. Still as to the recorded estimates of incapacity, Kaufmann reports three instances of lesions of the brachial plexus which resulted in *absolute* paralysis of the arm. The resultant incapacity he assessed at 75 per cent. in the right, and 65 per cent. in the left. Happily such cases are exceptional, but when met with they should certainly not be assessed at less than Kaufmann's estimate.

The French "Guide Barème" in *total* paralysis of the upper limb rates the resultant incapacity in the active at 70, in the passive limb at 60 per cent. In our own Schedule of Specific Injuries unfortunately, and we think very culpably, no figures are given for this same disability.

Turning now to the recorded estimates in *partial* types, Imbert in well-defined Erb palsy rates it at 20 to 25 per cent., and in the Klumpke variety at 30 to 40 per cent. These figures, be it noted, relate to cases in which the paralysis is not associated with *articular stiffness* and all passive movements remain feasible. The French "Guide Barème" in the Duchenne-Erb variety (paralysis of the deltoid, brachialis anticus, and biceps) evaluates the disability occasioned in the active at 20, in the passive limb at 10 per cent. In paralysis of the Klumpke type, disability in the active limb is rated at 30 per cent., in the passive at 20 per cent. These figures, at any rate in the Klumpke type, cannot be regarded as excessive. For ourselves, we would in this variety, when well marked, assess it in the right arm at from 35 to 40, in the left at from 25 to 30 per cent., reserving the higher figures for cases marked by severe *trophic* troubles. We would also in Erb's palsy assess it in the right at from 25 to 30, and in the left limb at from 20 to 25 per cent., the more elevated figures relating to cases complicated by stiffness of the shoulder joint.

### The Suprascapular Nerve

This nerve may be damaged alone or in association with the circumflex—this in sequence to falls on the shoulder or dislocation of the humerus. In industrial circles the victims are generally porters and mason's labourers—the cause of lesion in their

instance being pressure above the clavicle close to the side of the neck—when carrying heavy weights. Paralysis of the muscles supplied by this nerve forms an integral part of Erb's palsy.

### *Chief Clinical Phenomena*

Paralysis of the supra- and infra-spinati muscles is the salient feature in severe lesions. Through involvement of the *supra-spinatus* the power of abduction and inward rotation of the arm is diminished, as also the power of carrying the limb forwards. If this muscle alone be involved the *functional disability* entailed is *slight*, as it is but ancillary to the deltoid. It is, however, otherwise with the *infraspinatus*, which rotates the arm outwards.

### Factors in Evaluation

Through paralysis of the *infraspinatus* and its correlated loss of outward rotation many actions are hampered, notably of the pen along the line in writing, or the sweeping movement of drawing a thread upwards and outwards from material when sewing. As for the lost action of the supraspinatus, this is compensated for by the deltoid, and is therefore negligible.

### *Assessment*

It is clear that an intelligent appraisement of the incapacity occasioned by paralysis of the suprascapular nerve must involve a consideration of the victim's vocation. In the porter or labourer the impaired power of his supraspinatus will in time be compensated for by the hypertrophy of the deltoid. The loss of power in his infraspinatus will not incommode him very seriously. On the other hand, much graver disability is occasioned to the clerk, the artist, musician, or skilled mechanic. This not through loss of his supra- but of his infra-spinatus, with its correlated function of external rotation. The teres minor, if the circumflex be not involved, may, it is true, come to his aid, but in no sense comparably to that afforded by the deltoid to its paralysed fellow, the supraspinatus. For ourselves, we would therefore in a labourer assess the residual incapacity at 10 per cent., but in those following occupations in which the loss of power of external rotation of the arm is a serious handicap, we would rate it at 20 per cent.* According to Imbert, Guibé assesses the incapacity resulting from an isolated lesion of this nerve at 18 to 30 per cent.

* In isolated lesions of the subscapular nerve the French "Guide Barème" rates the resultant incapacity at 15 in the active, 10 per cent. in the passive limb.

## The Circumflex Nerve

Mme. Benisty in several hundred examples of peripheral nerve lesions never encountered an isolated palsy of this nerve. She adds that a lesion of the circumflex or its branches is, in fact, never met with save in association with paralysis of other collateral or terminal branches of the cervical or brachial plexuses.

In civil life, injury to this nerve is usually *subcutaneous*—a sequel to falls on the shoulder, dislocations thereof, or more rarely pressure by a crutch. Treatment on the usual lines is generally successful, but recovery is usually slow.

### Factors in Evaluation

The sensory disturbances are, from the point of view of assessment, negligible, though their detection is of prime *diagnostic* importance. On the *motor* side, it should be recognized that paralysis of the circumflex nerve does not necessarily *immobilize the shoulder*. For the supraspinatus and clavicular fibres of the pectoralis major acting in conjunction with the trapezius may by substitution compensate for the loss of power in the deltoid muscle.

#### *Assessment*

The recorded estimates as to the degree of incapacity entailed in this lesion vary widely. At one extreme, Thiem assesses it at 60 per cent. in the right, and 50 per cent. in the left arm. At the other, Remy accords 15 per cent. in the right, and 12 per cent. in the left limb. The somewhat elevated assessment of the former, though perhaps justifiable in aggravated examples, must be regarded as exceptional in view of the fact that if properly treated the condition slowly undergoes amelioration. Alive to this favourable outlook, the residual or permanent incapacity—both by French and Swiss authorities—is rated at from 15 to 20 per cent. The French "Guide Barème," be it noted, rates the incapacity in the active at 20, in the passive limb at 10 per cent. This may be taken as a minimum, though obviously according to the accessory features—the degree of muscular atrophy, the results of physical therapy, etc.—the estimates of the residual incapacity would, to our mind, call for elevation *pari passu* up to 25 to 30 per cent. or even higher.

## The Musculo-cutaneous Nerve

This in war injuries is subject to divers contingencies—complete division, contusion, or compression by callus. Like the

circumflex, it scarcely ever sustains an isolated injury. Usually an integral part of brachial plexus lesions, it is sometimes involved with musculo-spiral or median in lesions situated lower down in the arm.

### *Chief Clinical Phenomena*

On the *motor* side paralysis or paresis of the biceps, coraco-brachialis, and brachalis anticus ensues, with loss or diminution of the power of elbow flexion and supination of the forearm. Muscular *atrophy* is generally of high grade and the reaction of degeneration well marked.

Sensory changes are variable, and may be grave or slight, while in partial lesions of the nerve, neuralgic pains or a definite *causalgia* may supervene.

### Factors in Evaluation

It cannot be denied that severe lesions of this nerve, even when isolated, entail grave disability through the consequent impairment of flexion of the elbow and supination of the forearm. Naturally, given a concomitant lesion of the musculo-spiral these latter are greatly accentuated. It is otherwise if the musculo-spiral be intact, as then flexion of the elbow can still be compassed by the agency of the supinator longus. From the point of view of evaluation, the *sensory* changes in the absence of causalgia are negligible. The *prognosis*, too, is relatively good, the motor and sensory disabilities recovering simultaneously in a few months' time.

### *Assessment*

In essaying assessment of the resultant incapacity in total lesions of the musculo-cutaneous, the same, as in all nerve lesions in the arm, must be viewed in light of its effect on the functions of the hand. When we recollect that the power of flexing the elbow is almost suppressed, and likewise that of supinating the forearm, we may readily realize that the usefulness of the hand is most gravely prejudiced.

Consequently none will dispute the fact that *total* lesions of this nature call for a high assessment. The French " Guide Barème " in the active limb rates the incapacity at 50 per cent., and in the passive at 40 per cent. This assessment appears to us quite appropriate, and the same should in *incomplete* palsies be reduced to 30 and 20 per cent. respectively. Concomitant total paralysis of the *musculo-cutaneous* and *musculo-spiral* nerves would call for elevation of these figures to 70 or even 80 per cent.

## The Musculo-spiral Nerve

Of all peripheral nerves the most frequently injured is the musculo-spiral. Its special vulnerability is attributable to several factors. Thus, the humerus is very open to fracture, and the contiguity of the nerve thereto subjects it to the menace of secondary implication thereby. Indeed, the Alder Hey Statistics clearly show that in war wounds it is not the projectile but the fractured humerus which is most often responsible for lesions in this nerve.

In civil life, out of 242 cases of paralysis of the arm collected by Remak, 105 were due to lesions of this nerve. This predominance is referable to divers contingencies. First, the liability to pressure, which accounts for the frequent incidence of crutch and sleep palsies. More rarely, violent contraction of the outer head of the triceps has been the causal factor. Lastly, we have the frequency with which paralysis of the musculo-spiral is met with as an *occupation disease*. But even when due to metallic poisoning—lead, arsenic, or silver—there is generally superadded an element of trauma.

### *Chief Clinical Phenomena*

While the nerve may be injured in any part of its course, the site of the lesion is generally high up in the axilla or arm. If injured in the *middle third* of the arm, total paralysis of the *supinator longus* and the *extensors* of the *wrist* and *fingers* ensues. Clinically this is evidenced by immediate and pronounced wrist and finger drop. Flexion of the forearm on the arm—with the hand in a position midway between supination and pronation—is impossible. The prominence normally produced during the performance of this movement by the supinator longus is absent. Extension of the wrist and the first phalanges of the fingers is impossible, and with this also loss of the power of abduction of the thumb. Very rarely when the injury is limited to the *posterior interosseous* branch a partial or *dissociated* paralysis of the musculo-spiral nerve occurs.

*Subjective* disturbances of sensibility are rare, and according to Mme. Benisty in only 1 per cent. does an acute *causalgia* develop. The *objective* disturbances, too, are relatively slight when we have regard to the area of skin supply by the musculo-spiral compared with other nerves of the arm. The sensory changes are delimited to the first dorsal interosseous space and the dorsum of the thumb. Trophic, vasomotor, and secretory phenomena are usually lacking.

*Fallacious Signs of Recovery*

There are certain pitfalls to be avoided in forming an estimate as to the recovery of motor power. Thus, if the subject of musculo-spiral paralysis makes strenuous attempts to extend the wrist a simultaneous elevation of this joint ensues which may be wrongly interpreted. The same is due, not to returning power in the extensors, but to *strong contraction of the flexor muscles.* This is accounted for by the fact that normally, when the fingers are voluntarily extended at the metacarpo-phalangeal joint, there ensues an associated action on the part of the antagonist muscles —the flexors.

To avoid misinterpretation, therefore, we should, when the subject makes efforts to extend his wrist, not only palpate the extensor, but also the *flexor* muscles of the wrist and fingers. Again, we should beware lest in palpating the muscles we be led astray by the tension of the *anti-brachial aponeurosis* brought about by contraction of the epitrochlear muscles, which may readily be erroneously referred to contraction of the extensor muscles.

*Genuine Signs of Impending Recovery*

An interesting feature in injuries of the musculo-spiral nerve is the *order* in which *the related muscles regain voluntary motility.* The sequence is so distinctive that it may be taken as a sign of impending recovery. It might be thought that—owing to the lesser distance to be traversed by the axis cylinders in course of repair—the branches nearest the lesion would be the first to recover, and the muscles affiliated thereto. But it is not so, and some investigations of Pierre Marie, Meige, and Gosset supply us with an intelligible explanation of this unlooked-for sequence of repair.

Direct electrical stimulation of the nerve, when exposed in surgical operations, shows that the nerve fibres of the *radial extensors* are situated in the *antero-internal* bundle of the musculo-spiral trunk. Those responsible for *extension* of the fingers are located in the *postero-internal*, and those for the supinator longus in the *external fasciculi.* Hence it is that the muscles as a rule recover in the following order : *radial extensors, common extensor, supinator longus, extensors of the thumb, and abductor longus pollicis.* Not infrequently the supinator longus regains power before the extensor communis digitorum, while in exceptional instances the former is the first of all the muscles to recover. Of the *individual digits* the three inner usually regain motility before the index finger. But such is not invariable, as sometimes the index and middle steal a march on the others.

*Tests for Impending Recovery*

In attempts at extension of the wrist, if the extensor muscles are felt to harden on palpation, movement will before long be regained. To assure oneself that it is the *radial extensors* that are recovering, one should palpate the tendons at the wrist while the subject makes repeated attempts to extend this joint.

Or we may adopt the following plan : the patient's forearm, with the hand extended, is placed *vertically* to the table. He is then told to keep the hand extended and not permit it to drop. Maintenance of the hand, if only for a few seconds, in this *extended* position shows that the muscles are regaining their tone.

Professor Pitres, in the *Revue Neurologique* for April–May 1916, has enumerated some further tests of impending recovery :

(1) During the initial stages of recovery the subject, if his hand be placed in complete *pronation*, is unable to extend his wrist. But if the adopted pose be one of *semi-supination* he can achieve extension, owing to the lesser obstacle presented.

(2) *Diminution of the Automatic Flexion of the Fingers.*—In a case of musculo-spiral paralysis, if the back of the hand is applied to a table, the fingers automatically assume a position of *semi-flexion*. If now the latter be completely extended and be then left to themselves, they quickly lapse back into the position of semi-flexion. A decrease, then, in this automatic flexion would indicate the recovery of muscular tonus in the extensors.

(3) *Progressive Decrease of Automatic Pronation.*—The attitude of the forearm in musculo-spiral paralysis is one of *pronation*. Placed in supination and then released it quickly returns to its former position. But with the onset of recovery this return to pronation is more gradual in its incidence.

*Signs of Cure*

For recovery to be considered complete the subject should be capable of extending simultaneously the wrist and all the fingers. In addition he should be able to extend each finger separately.

Professor Pitres suggested the following methods of exhibiting this simultaneous extension of the wrist and fingers :

(1) If the patient, with the palm of the hand directed forwards and the fingers in full extension, be able to place his little finger in *close apposition* to the seam of his trousers he can be adjudged as cured.

(2) Direct the patient to place his arm in the attitude of one taking an oath—viz. with his wrist and fingers extended, his thumb abducted and extended so as to show the extensor tendons in bold relief. Subsequently he should be told to supinate his

hand. If he can achieve both these movements, then the cure of his musculo-spiral paralysis may be assumed.

### Factors in Evaluation

While the nerve may be injured in any part of its course the site of injury is generally high up in the axilla or arm—hence the considerable incapacity entailed.

Contrasting with the median and ulnar, the musculo-spiral nerve subserves *extension*, and therefore, when paralysed, the hand and fingers fall into a position of flexion—viz. *wrist drop*. Not infrequently, if the nerve be injured near the middle of the humerus the *triceps* muscle escapes.

In cases of *total paralysis* the following disabilities are occasioned: The subject can extend neither his fingers nor hand while his thumb is in a position of flexion and adduction, and can neither be extended nor abducted. Moreover, the extensors of the elbow being paralysed, the subject has to enlist the action of gravity to bring arm and forearm into a straight line.

An important feature of these cases, too, is that, although the hand and fingers are in a position of flexion, nevertheless the subject finds it painfully difficult to complete the act and close his hand firmly. This by reason of the fact that the wrist being flexed the flexor muscles, although intact, act at a mechanical disadvantage. For their points of attachment being thus approximated, they have, so to speak, to take in slack before they can act vigorously. Of this one can readily convince oneself by attempting to close the fist when the wrist is flexed, and afterwards when it is in extension—the strength of fist closure in the latter instance being clearly much superior.

As before stated, the prognosis in cases of injury of the musculo-spiral is much more favourable than any other nerve. In the first place, the majority of its lesions through injury in civil life are *subcutaneous*, and result, therefore, only in *incomplete physiological division*. Again, the nerve, if injured in the lower third of the arm, is happily situated in that it is not exclusively responsible for any sensory skin supply, while on the motor side "the muscles it innervates are not so intimately associated with delicate movements of the fingers as are those supplied by the ulnar." Sherren emphasizes these points, and sums up the outlook in injuries as follows: "If treated by relaxation of the paralysed muscles, recovery is rapid, and usually perfect within three months. When operative treatment is necessary to free the nerve from injurious pressure, restoration of function usually commences in a few weeks. After secondary suture, motor

power usually returns in nine to twelve months, and perfect use is regained within eighteen months."

*Assessment*

In framing our estimates as to the incapacity entailed by paralysis of this particular nerve we should take into consideration the fact that, unless too long delayed, operation is followed by remarkably good results. Certainly in cases due to pressure by callus one should not hold incapacity as permanent until disengagement of the nerve has been attempted. Indeed, whether attempted or not, one should not affirm that paralysis will be permanent, save only when prolonged and careful treatment has been carried out—this, of course, in cases where the electrical reactions justify a hopeful outlook.

On the other hand, in the rare cases in which paralysis appears irremediable, it is clear that we must regard the resultant incapacity at any rate as considerable in degree. As in all nerve lesions of the upper limb, this particular nerve injury also must be judged in the light of its effect upon the working capacity of the hand. Now, as we have seen, the power of extension of fingers and wrist is lost, and we have noted how gravely this hampers the strength and usefulness of the hand. How much so may be gathered from the appended table of evaluation of paralyses of the hand as laid down by Remy, reference to which clearly shows that total paralysis entails more or less complete suppression of the functions of the hand. In consideration of this, none would dispute Remy's assessment of the resulting diminution in the victim's general aptitude for work. He rates it in the right hand at 60 per cent., in the left at 48 per cent.—figures with which Imbert, the noted French expert, finds himself in accord. In the French " Guide Barème," paralysis of the musculo-spiral in the active limb is rated at 60, in the passive at 50 per cent. The awards, too, of German jurisprudence in this same lesion oscillate between 40 and 60 per cent.

Lastly, should the functional disabilities occasioned by paralysis of this nerve prove irremediable by neurorraphy or neurolysis, and yet admit of amelioration by *tendon transplantation*, then the final assessment should be postponed until the results thereof can be appraised, and the assessment of the residual incapacity possibly lowered.

## The Median Nerve

As compared with other nerves in the upper limb, paralysis of the median is relatively rare. In gunshot wounds it is not uncommonly associated with lesions of other trunks, the ulnar,

musculo-spiral, musculo-cutaneous, or internal cutaneous. It may be implicated secondarily in fractures of the radius or ulna. Esmarch's bandage is responsible for some instances, and Continental authorities assert that certain occupations predispose to median palsy—namely, cigar-making, carpet-beating.

### *Chief Clinical Phenomena*

Unlike the musculo-spiral, lesions of the median nerve give rise to various symptom complexes. Clinically speaking they evolve as *painful* or *painless* types—the latter capable of further subdivision into examples marked by *total* and *partial* or *dissociated* forms of paralysis.

As to the *painful* type associated with the name of Weir Mitchell, its predominant characteristic is pain—viz. causalgia. Developing as a rule some two or three weeks after injury, it is paroxysmal, intense, and defiant of treatment. There is usually diminished sensibility to light touch over the painful area.

The motor disturbances are relatively slight, and usually take the form of *paresis*, more particularly of the flexor indicis and thenar muscles.

As to the *painless* types, the paralysis may be total, but it is commonly of partial or dissociated distribution. In *total* paralysis the following motor disabilities are occasioned: Pronation of the forearm is defective, as also flexion of the wrist. As to the fingers, there is loss of power of flexion of the terminal phalanx of the thumb, of the index finger as a whole, while the middle finger is capable of only very slight flexion. Flexion of the ring and little fingers is impaired to a less degree, as the flexor profundus (innervated by the ulnar) is responsible for this movement. Lastly, the powers of opposition and abduction of the thumb are much enfeebled. The *electrical reactions* are pronounced at first; all the paralysed muscles give the reaction of degeneration, and ultimately with increasing atrophy they fail to respond to either current.

The *sensory* changes consist of total anæsthesia to all forms of stimuli over the front and back of the two terminal phalanges of the index and middle fingers. In still more severe lesions the thenar eminence and thumb are also anæsthetic.

Fortunately total paralysis is uncommon, the *partial* or *dissociated* variety being of more frequent incidence. It is therefore essential that we be familiar with the lesser degrees of disability imposed thereby. Thus, in contrast to the complete form, there is little, if any, impairment of the power of flexion of the wrist and pronation of the forearm. On the other hand,

there is loss of flexion of the terminal phalanx of the thumb, which latter, in addition, is seriously crippled in regard to its power of opposition. Lastly, the power of flexion of both middle and index fingers, especially the latter, is much diminished. The flexor longus pollicis and thenar muscles give a partial reaction of degeneration. As to the *sensory* disturbances, these take the form of diminished sensibility to light touch, heat, and cold, and in exceptional instances anæsthesia, usually most pronounced over the two terminal phalanges of the index.

In further contrast to the *complete* type, the *vasomotor* and *secretory* changes in these incomplete forms are very emphatic. The skin area of the median stands out purplish blue in colour, cold to the touch, and bedewed with sweat.

*Fallacious Signs of Recovery*

As in the case of the musculo-spiral nerve, we must, in attempting to estimate the measure of motor recovery, beware of certain fallacies. Thus, for example, in testing the *flexors of the wrist*, not only should the bellies of the muscles, but also their tendons, be palpated. Again, it must be recalled that—especially in *combined lesions of the median and ulnar* nerves—the *extensors* of the wrist and fingers are capable of compassing an *apparent flexion* of these same. When asked to bend his wrist, the subject, through the medium of his extensor muscles, achieves hyperextension of his wrist, and subsequently thereto there ensues sudden relaxation of the extensors, whereupon the hand undergoes slight *passive* flexion—this latter movement being reinforced by active contraction of the extensor ossis metacarpi pollicis.

Again, in appraising the genuineness or not of recovery in the *thenar* muscles we must be careful not to overlook the aid afforded by contiguous muscles. Thus the subject, if asked to bring his thumb into opposition with the other digits, may compass the desired end by a gliding movement of the thumb along the palm. This is brought about through the action of the adductor and short flexor, while simultaneously the tips of the thumb and fingers, through strong flexion of their terminal phalanges, are brought into contact. It may be observed that this latter manœuvre is only feasible if and when the action of the flexor longus pollicis has been regained.

*Genuine Signs of Impending Recovery*

As in the musculo-spiral, the recovery of the individual muscles takes place *serially*, and the *order* thereof being distinc-

tive, it may be taken as indication of impending recovery. The *pronator* muscles are the first to regain power. To avoid misinterpretation of the same, the elbow during the attempt at pronation of the hand should be kept rigid while the fleshy belly of the pronator radii teres is palpated nigh to its insertion into the middle third of the radius. In sequence to the pronators, the *flexors of the wrist* recover, and subsequently those of the middle finger and thumb. But the power of flexion of the *index*, as also of opposing the thumb, is rarely if ever wholly regained. Indeed, even after the initial processes of regeneration have set in, as long a period as two years may elapse, and still the same disabilities in a large measure persist.

### *Tests for Impending Recovery*

When testing for recovery of *flexors of the wrist* the dorsum of the forearm and hand should be placed in contact with the table, and in this way the inclination to extension of the wrist circumvented. If then, with these safeguards, the hand can be raised from the table—viz. *wrist flexion*—it demonstrates impending recovery of the flexors of the wrist.

Again, both in the case of the *thumb* and *fingers* we must, to avoid the fallacy above alluded to, exclude as far as possible any substitution through *hyperextension* of their basal phalanges. If this be achieved, and *flexion* of the thumb or fingers notwithstanding ensue, it may be taken as a genuine sign of returning power in the flexors of the digits.

### *Evidences of Complete Recovery*

If the subject can clench his fist firmly—viz. with the fingers strongly flexed into the palm and the thumb in close contact with the dorsum of the mid-phalanx of the third finger—then recovery may be held as demonstrated.

Professor Pitres considers that the power of performing the following manœuvre is proof positive of absolute recovery: The patient should be asked to place his hand palm downwards flat on the table, then if he can, without moving his wrist, scratch the table with his index finger it proves that his median palsy no longer exists.

### Factors in Evaluation

In attempting to evaluate the incapacities produced by the various symptom complexes occasioned through injuries of the median, what are the salient factors in assessment?

*Painful Type.*—It is clear that in this variety the dominant source of incapacity is sensory—*pain*. This, by reason of its

severity and inveteracy, entails absolute disablement pending its cessation. Consequently, during its progress we must assess the resultant disability as equivalent to *total paralysis* of the affected limb. We need have less compunction in so doing in that with the passage of time the pain tends to disappear spontaneously. But this happy result may not supervene for a considerable period, possibly two years. Nevertheless, even should the pain disappear it does not necessarily follow that all disability is removed, for the man's working powers may still be hampered by *paresis* of the *small muscles of the hand*, or persistent *involuntary movements* in the related digits.

But more important still, there may ensue irremediable *ankylosis* of the *terminal phalanges* and *wrist*, which may wholly incapacitate the limb. Given cessation of the pain we have then to assess these residual incapacities when existing.

*Painless Types.*—In these the dominant factor in evaluation is the motor disability—*paralysis*. Is it total or partial ?

Now in endeavouring to estimate the result on the working powers of *total* palsy, we must recall that the median nerve largely dominates flexion of the fingers and closure of the hand. Thus flexion of the second phalanx in all digits is impossible, and also of the end joints of the index and middle fingers (this, of course, strictly speaking as regards the median, but we have to recollect that, unless there be an associated lesion of the ulnar nerve, flexion of the mid-phalanx of the little and ring fingers can be produced through the agency of the deep flexor). The thumb is *extended, and can neither be flexed or opposed.* The wrist cannot be flexed except when forcibly adducted, while the power of *pronation* is lost, and last, but not least, the sensory disturbances are marked.

To sum up, *what is the result on the working powers ?* Now we see that through loss of flexor capacity and suppression of the functions of the thumb, the power of grasping firmly a large object is lost, as likewise that of selecting or picking out neatly any small article. Nor is this all, for rolling of the fingers is out of question, nor can the digits be twined round any slender cylindrical object, such as a pencil, etc. In short, the hand, if the subject's occupation necessitates highly specialized movements, is useless.

Moreover, when we turn to the question of surgical treatment even under the most favourable conditions the outlook is none too bright. Thus Sherren, discussing *prognosis after primary suture*, observes, " If the nerve injured is the median or ulnar, it is improbable that recovery, either motor or sensory, will be sufficient to enable delicate movements to be skilfully performed. Thus, while the hand may be perfectly useful to an unskilled

labourer, it would be a useless member to an executant musician."

*Assessment*

*Painful Types.*—In well-marked forms of *causalgia*, in which the victim in virtue of his pain is placed *hors de combat*, his incapacity must for practical purposes be rated as total and assessed at 70 to 80 per cent. Given cessation of pain, but, notwithstanding this, associated *ankyloses* of such a degree as to render the arm and hand useless, we should assess the resultant disability in the right limb at 60 per cent., in the left at 50 per cent. If ankylosis be absent, but the subject be hampered by persistent *paresis* or *involuntary movements*, a somewhat lower assessment is indicated —down to 30 or even 20 per cent.

*Painless Types.*—In these the dominant factor of evaluation is the degree of the *paralysis*, whether *total* or *partial*. Generally speaking the higher the lesion the more widespread the paralysis, and vice versa. Continental authorities, therefore, grade their evaluations according as to whether the lesion is low down or high up in the arm. This, indeed, is the criterion of differentiation in the French "Guide Barème." Thus, for *total* paralysis following section or compression of the median nerve, the following is their method of evaluation:

| | Active limb | Passive limb |
|---|---|---|
| (*a*) In the arm . . . . . | 50 % .. | 40 % |
| (*b*) In the hand . . . . . | 20 % .. | 10 % |

Now while, broadly speaking, it is true that, if the lesion is high up in the arm, the paralysis is extensive, and if low down more circumscribed, it is not invariably so. For the vagaries of *fascicular* localization are such that a lesion high up in the arm may result in only a *partial* paralysis. We see, therefore, that no constant relationship exists between the *site* of the lesion and the degree of the resultant incapacities in injuries of the median nerve. We must, in short, adhere to the cardinal rule—base our evaluation on the *degree of functional disability* that actually exists, and this independently of the *localization* of the lesion.

Taking this as our basis we would, in cases of *total* paralysis of the median, estimate the incapacity entailed in the right arm at 60, in the left at 50 per cent. Remy, in instances in which the nerve is divided *high up in the arm*, rates the disability (from the point of view of the general aptitude of the victim for work) in the active limb at 50, in the passive at 40 per cent.; while Imbert in similar cases considers that to assess their incapacity at 45 to 50 per cent. is by no means excessive. German authorities, too, take a grave view of these cases of total paralysis—

rating the resultant disability therein in the right at 45, in the left arm at from 33 to 40 per cent.

Turning now to a *partial* or *dissociated* palsy, what is the resultant incapacity? Here again it is sufficiently grave. This is obvious when we recall the grave disabilities imposed on the thumb by loss of the power of *opposition*. We have also to recollect that apart from this the performance of highly specialized movements is gravely compromised by the loss of flexion in the index and middle fingers—a disability, moreover, emphasized in the former digit by its *anæsthetic* state.

Here, therefore, is a case in which some regard should be had to the victim's occupation. Certainly if this demand *highly specialized movements* the disablement occasioned is infinitely greater than if the vocation be one demanding brute strength rather than skill.

Accordingly, in instances of *partial* paralysis—indifferently whether the lesion be located high up or low down in the arm—we would rate the resultant incapacity in the right limb at from 35 to 45, in the left at from 25 to 35 per cent., reserving the higher figures for skilled workers or cases with aggravated *vaso-motor* and *trophic* phenomena. Remy, indeed, in cases of section *just above the wrist* rates the incapacity even higher—at 45 and 36 per cent. respectively; but Imbert in similar cases allots only 15 to 20 per cent., which we consider is miserably inadequate. Lastly, should the functional disabilities occasioned by paralysis of this nerve prove irremediable by neurorraphy or neurolysis, and yet admit of amelioration by *tendon transplantation*, then the final assessment should be postponed until the results thereof can be appraised, and the assessment of the residual incapacity possibly lowered.

## The Ulnar Nerve

In *war* wounds this nerve may alone be injured or suffer damage coincidently with the median or other nerves of the upper limb. It may be implicated secondarily through fractures or dislocations of the elbow joint. It is also a common form of sleep paralysis.

### *Chief Clinical Phenomena*

Complete and partial types of ulnar paralysis may be differentiated clinically, the latter being noteworthy in that this dissociated variety is frequently met with in wounds high up in the arm.

*Complete Paralysis.*—In this form the flexor carpi ulnaris is paralysed, as shown by defective power of flexion of the wrist

against resistance. Flexion of the ring and little fingers can only take place at the mid-phalangeal joints through the action of the superficial flexor. The hypothenar muscles undergo loss of power. The proximal phalanx of the little finger cannot be flexed on the metacarpal, neither can the little finger be abducted nor adducted. Again, owing to paralysis of the interossei and the inner two lumbricals, the ring, like the little finger, can neither be abducted nor adducted, and frequently the middle finger is similarly handicapped. Lastly, this form of paralysis results in the salient deformity—the claw hand—in which the fourth and fifth finger, and sometimes the third finger, are involved.

Muscular wasting is very marked, especially in the first dorsal interosseous space. The hypothenar eminence becomes hollowed, and the wasting of the adductor pollicis stands revealed both to sight and touch. Lastly, all the paralysed muscles show a complete reaction of degeneration.

As to the *sensory* changes, in severe lesions there ensues total loss of epicritic and protopathic sensation over the back and front of the little finger and inner margin of the hand; over the residual area of skin supply there is diminished response to pin-prick, and more or less complete thermal anæsthesia. Vaso-motor, secretory, and trophic disorders are often present.

*Partial Paralysis.*—Here the *motor* disorders take the form of *paresis* of the ulnar flexor and deep flexor, with paralysis of those intrinsic muscles of the hand supplied by this nerve trunk. Clawing may be wholly absent, but is usually present in the two inner fingers, especially when at rest. Muscular wasting is most evident in the first interosseous space and the hypothenar eminence. Electrical changes, though variable in character, are most pronounced in the intrinsic muscles of the hand—notably the inner interossei and hypothenar muscles.

As to the *sensory* changes, causalgia, apart from associated lesions of the median nerve, is never seen. Objectively the sensory disturbances are less pronounced than in total paralysis, taking the form of hypæsthesia.

### *Signs of Impending Recovery and Cure*

The order in which motor recovery takes place in individual muscles is as follows:

The *flexor carpi ulnaris* is the first to regain power; the *deep flexor* comes next; and finally the *interossei, hypothenar muscles,* and *adductor pollicis.* There is just one point to be remembered, that if the paralysis of the deep flexor undergo amelioration the clawing may become more emphatic.

As to a test whereby the attainment of cure may be established, Professor Pitres makes the following demand: If the hand, palm downwards and fingers separated, be laid flat upon the table, the subject should be capable of moving the middle fingers in both directions from the middle line, and also, without raising his wrist, be able to scratch the table with his little finger.

### Factors in Evaluation

The ulnar nerve, like the median nerve, concerns itself with flexion, and conformably its paralysis finds expression in an attitude of *extension*. Thus complete flexion of the two inner fingers is impossible, and the little finger can scarcely be moved at all. The fingers cannot be separated or adducted, and the thumb sticks out obtrusively.

In *complete* paralysis the disability entailed is very considerable, especially if the hand has assumed a *claw* position. Indeed, it may be said that the prognosis and resultant incapacity in injury of the ulnar nerve depends entirely on how far the tendency to claw hand has been obviated. Instances in which it has developed are little likely to benefit by suture; on the other hand, Sherren observes that "if in cases of incomplete division or after *primary suture* a suitable splint is worn, perfect recovery may take place, although it is unusual in the latter." Continuing, he further remarks that "perfect recovery never follows *secondary suture* or operations undertaken to relieve pressure on the nerve in cases of long-standing deformity of the elbow or dislocation. For some weakness inevitably remains in the *intrinsic muscles of the hand.*" As to the period that may elapse before motor recovery after primary suture and aseptic healing, it may, according to Sherren, occur in two years, but after secondary suture it will scarcely ever be complete.

In the *incomplete* types there may, as we have said, be a *total absence of clawing*, and in such the incapacity that exists is chiefly due to *paralysis of the intrinsic muscles of the hand* reinforced by the weakness of the ulnar and deep flexors.

#### *Assessment*

Here, as in the median, estimates of incapacity have been largely based on the location of the lesion, whether high up or low down. The erroneousness of this method of evaluation is obvious, for assessments should be in *proportion to the degree of disablement* produced. Now the functional disability is independent of the *site* of the lesion. It is its *nature*, not its site,

that matters. Nevertheless, the French "Guide Barème" still adheres to the *site* of the lesion as the criterion of the gravity or not of the degree of disablement occasioned through injuries of the ulnar nerve. Their figures of assessment are as follows:

| | Active limb | Passive limb |
|---|---|---|
| (*a*) At the level of the elbow . . . | 50 % | 40 % |
| (*b*) In the hand . . . . | 10–15 % | 10 % |

Now if we attempt to assess the resultant incapacities according to the level of the lesion, we forthwith get into difficulties. For this reason: a lesion may be high up in the arm, or actually in the *axilla*, and yet the resultant paralysis is *partial, incomplete,* or *dissociated* in character. It may be low down, and yet the resulting paralysis may be complete—viz. all muscles below the lesion may be paralysed. Accordingly, if we followed the French method—namely, based our evaluation merely on the level of the lesion, as necessarily predicating a higher or lesser degree of disability—it would follow that our assessment of the incapacity in individual instances might be excessive or the reverse.

To escape this fallacy, therefore, we must have regard only to the nature of the lesion and the resulting paralysis, whether total or partial.

Now the French estimates in *total* paralysis of the ulnar nerve are, we venture to think, somewhat high. This at any rate in light of the fact that they only assess total paralysis of the *median* at the same figure (50 per cent.), despite the fact that the functional disability produced by injuries of the latter is far more pronounced than in lesions of the former. For ourselves we think that this difference should be reflected in the figures of assessment. We have, as before mentioned, accorded 60 per cent. and 50 per cent. in paralysis of the right and left median, and this in a case of a similar lesion of the *ulnar* we would lower to 50 and 40 per cent. in the right and left limb respectively.

Reverting now to instances of *partial* paralysis, given a fascicular lesion in the *axilla* or *high up in the arm*, paralysis of those intrinsic muscles of the hand supplied by the ulnar, with simple paresis of the flexor carpi ulnaris and flexor profundus digitorum, may ensue. On the other hand, a lesion *at or near the wrist* will result in paralysis, complete or incomplete, of the intrinsic muscles of the hand. But in either event the ensuing paralysis, relatively to the total nerve supply of the ulnar, is *partial* in extent.

Now what are the particular disabilities occasioned in the above varieties of paralysis? In other words—for this is the salient point at issue—to what extent have the *functions of the*

*hand* been compromised? Now, despite the *clawing* of the hand it may at once be affirmed that—*qua* the intrinsic muscles of the hand—its functional capacities are not so much impaired as in similar lesions of the *median* nerve. In the former, the victim, it is true, is considerably inconvenienced by the weakness of his *index* finger—his inability to extend the second and third phalanges thereof. He finds the act of writing difficult, as likewise the execution of any work calling for vigorous extension of these phalanges. On the other hand, he still retains the ability to oppose the thumb to the fingers, and hence he can grasp, though somewhat feebly (owing to adductor and interosseal paralysis) both voluminous and small objects. Again, the power, too, though very diminished, of twining his fingers round a slender cylindrical object is not beyond his capacity. Nor, likewise, is rolling of his digits—movements all of them impossible in cases of injury to the *median* nerve. Hence, whether we regard the lesion in light of its effect on the functional capacity of the hand, or of the victim's general aptitude for his work, we see clearly that the resultant incapacity is far less than in lesions of the median nerve.

Accordingly we consider that the French estimates of 10 to 15 per cent. are too low—figures which in the British Schedule disqualify for a *permanent* pension. This, if the paralysis, with or without clawing, be *incurable*, appears to us unjust. For ourselves we would, in *partial* paralysis resulting from *fascicular* lesions in the *axilla* or *upper arm*, be inclined to rate the resultant incapacity higher than if the lesion were situate *at or near the wrist*. This because in addition to the intrinsic muscles of the hand the ulnar flexor of the wrist and the deep flexor of the fingers are weakened. We would, therefore, in this case, in the *right* limb rate the resultant incapacity at 30 per cent., in the *left* at 25 per cent., lowering these, in the case of lesions *at or near the wrist*, to 25 and 20 per cent. respectively.

Lastly, should the functional disabilities occasioned by paralysis of this nerve prove irremediable by *neurorraphy* or *neurolysis*, and yet admit of amelioration by *tendon transplantation*, then the final assessment should be postponed until the results thereof can be appraised, and the assessment of the residual incapacity possibly lowered.

## EVALUATIONS OF PARALYSES OF THE HAND BY REMY

| Enumeration of lesions or mutilations. | Working functions of the hand. | | | | | | Loss of value resulting from lesions or mutilations. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Pollici-digital ring or opposition. | Hold. | Grasp. | Rolling of fingers. | Direction. | Strength. | For the hand considered by itself and alone. | For the victim considered from the point of view of his general fitness for work. | |
| | | | | | | | | If the active hand is affected. | If the passive hand is affected. |
| | | | | | | | | Per cent. | Per cent. |
| Musculo-spiral nerve. | Impossible. | Impossible. | Impossible. | Impossible. | Impossible. | Impossible. | Total. | 60 | 48 |
| Median nerve by division above wrist. | Greatly impaired. | Lessened. | Lessened. | Lessened. | Lessened. | Lessened. | $\frac{3}{4}$ | 45 | 36 |
| Division of median nerve in arm. | Impossible. | Impossible. | Lessened. | Impossible. | Impossible. | Impossible. | $\frac{5}{6}$ | 50 | 40 |
| Division of the ulnar nerve in the palm. | Preserved. | Preserved. | Greatly diminished. | Preserved. | Diminished. | Diminished. | $\frac{1}{5}$ | 12 | 10 |

NOTE.—Paralysis of the musculo-spiral nerve can be improved to a certain extent by an apparatus which artificially straightens the wrists and fingers.

## CHAPTER XXI

## INJURIES TO NERVES OF THE LOWER LIMB

### Cauda Equina

THE brachial plexus is, as we have seen, most complicated in its constitution, but happily the cauda equina is less intricate in its make-up. The outcome of a blend of the last lumbar and the sacral nerve roots, this structure is liable to injury in its intraspinal route, and this either prior to or after piercing the theca. Usually *bilateral*, the lesion in rare cases may be wholly unilateral. If the former, the distribution of the symptoms, owing to the unequal involvement of the roots, is *asymmetrical*—viz. implicates one limb more than its fellow.

To determine in any given case the particular roots damaged, it is essential that we familiarize ourselves, not only with the distribution of the nerve roots, but the exact functions of the muscles affiliated thereto, as also the related cutaneous areas. As an adjunct to our systematic examination of any given case it is well, too, that we have a clear idea of the *course of the projectile*, as gleaned from its sites of entry and exit.

#### *Chief Clinical Phenomena*

Even if such were our intent, the *variability* of these would defy exhaustive description. Generically speaking, lesions of the cauda equina, whether localized to the anterior or posterior roots or involving both, give rise to motor and sensory disorders, the distribution of which is *radicular*. Naturally the extent of the motor and sensory paralysis will vary according to the *number* of roots involved, and the location of the phenomena according to the *identity* of the roots implicated. Whatever roots be damaged, *paralysis* and *disturbance of sensibility* ensue which may be *total*, involving all the motor and sensory supply of the lower limbs and implicating both sphincters, while rendering the genital and perineal regions anæsthetic. Generally, however, the paralysis and disturbances of sensibility are more pronounced in one limb than the other.

The *sphincter* troubles are a distinctive feature of lesions of the cauda equina. Frequent in incidence the troubles of *defæcation* generally subside prior to those of micturition, though complete restoration in either case is unusual. Lastly, no description,

however meagre, would even be reasonably comprehensive if it took no cognizance of the excruciating *pain* which is so marked a feature in many examples. Fortunately cauda equina lesions, like those of the brachial plexus, show a tendency to *spontaneous recovery.*

### Factors in Evaluation

It may be assumed that cauda equina lesions of any gravity portend for a prolonged and indefinite period *total* incapacity. In such grave instances the initial evaluation is of course obvious —discussion is out of court. It is in the later stages of their life-history that *discrimination* must be exercised in their assessment. In other words, these cases fortunately tend to recover to a greater or lesser extent. Our task, then, is to determine the measure of the *residual incapacities*—an estimate not to be attempted prematurely. Not until the normal processes of cure have had ample time to mature and the potentialities of therapy are exhausted.

Given that a case comes up for assessment after it has reached its final condition, it will be the duty of the assessor to gauge the measure of the *residual incapacity.* To achieve this he must investigate systematically the *motility* of each segment of the lower limbs, the *state of the sphincters,* while not forgetting to determine the *sensory* defects, if any. He will, of course, realize that the distribution of the motor paralyses or pareses will be *radicular* and not peripheral.

His next step will be to weigh his clinical findings in the light of their effect on the *functional utility* of the limbs—one or both. Thus, for example, if the *first* and *second* lumbar roots be involved, what is the *resultant incapacity* ? Such will inevitably be a greater or less degree of *paresis* of the psoas, iliacus, and pectineus muscles. In other words, this predicates a diminished power of flexion of the hip, and some depreciation of adduction of the thighs.

Again, if the lesion be located in the *third* and *fourth lumbar roots,* the *residual incapacity* will be localized to the quadriceps extensor, adductors, and tibialis anticus muscles. Here, unlike the former variety, the *upper* and *lower* segments of the limb are involved. The subject's power of extending his leg, adducting his thigh, or of dorsiflexing his foot is *weakened* or *lost.*

If the *fifth lumbar* and *first sacral* roots be implicated, the peronei, extensors of the toes, and the muscles of the sole and calf are more or less *paretic.* In the same way, if the lesion be localized to the *second sacral,* the functions of the hamstrings and glutei are more or less compromised; if to the *third, fourth, fifth sacral and coccygeal roots* such troubles as are present relate to the levator ani and perineal muscles. Lastly, in both lesions of the cauda equina and those of the *conus medullaris* the integrity of the sphincters, both rectal and vesical, is lost or impaired.

*Assessment*

While the foregoing paragraphs furnish us with an approximate guide to the disabilities incidental to lesions of the cauda equina, it must be realized that the differentiation is largely theoretical. Clinically the syndromes presented are like a mosaic of varying pattern, the vagaries of wounds in this region being endless, and their manifestations protean in character. Accordingly each case must be judged *individually*, and the existing incapacity gauged. Obviously, such would be *total* in examples of *paraplegia* with involvement of both *sphincters*, which should be estimated at 100 per cent. If the sphincters be intact, it would be a question of gauging the measure of incapacity referable to the existing *motor disabilities*. These, generally speaking, are most pronounced in lesions involving the *upper* roots.

Given, therefore, a case marked by loss or grave diminution of *hip flexion*, the resulting incapacity should be assessed at 70 per cent. If the predominant disability be *loss* or *diminution* of the power of *extending the leg*, assessment at 50 to 60 per cent. appears to us equitable. Lastly, in instances in which the residual paralysis or paresis is restricted to muscles of the *lower segment of the leg*, our evaluation should range from 40 down to 20 per cent., the former figure being reserved for cases of *paralysis*, the latter for those marked by greater or lesser degrees of *paresis*.

## Sciatic Nerve

According to Mme. Benisty, lesions of the great sciatic and its external popliteal branch are nearly as common as those of the musculo-spiral nerve. Clinically, as in the *median*, total and partial types of paralysis are met with—the latter often of *painful* nature.

*Chief Clinical Phenomena*

*Total Paralysis.*—If the sciatic nerve be injured at or near the notch it causes paralysis of the flexors of the leg and muscles below the knee. If the lesion in the nerve be below the middle of the thigh its salient features are loss of the power of dorsal and plantar flexion of the ankle and toes, as also of inversion and eversion of the foot. In the standing position foot and toe drop are marked, while the plantar arch automatically sinks. Though at first marked by *œdema*, the calf muscles and hamstrings eventually undergo marked atrophy.

As to the *electrical* reactions, the hamstrings give a *partial* R.D., but the muscles of the foot and leg furnish a *complete* reaction of degeneration.

*Subjective Sensory Disturbances* are usually lacking, but total anæsthesia is present, involving the whole foot (with the exception of the inner border and internal malleolus), also the lower third of the posterior and outer surfaces of the leg. With the passage of time the anæsthesia of the leg may diminish, but not that of the foot. Owing to the implication of the *secretory*, *vasomotor*, and *trophic* fibres, *anidrosis*, *lowered* surface temperature, and ulceration are not uncommon.

*Partial Paralysis.*—The internal and external popliteal fasciculi of the sciatic are distinct within the sheath of the trunk, and this even in its intra-pelvic course as was long since pointed out by Aeby. Consequently one bundle alone may be implicated, and the symptoms be either those of an internal or external popliteal paralysis (the so-called fascicular localization). Most commonly the *external* popliteal branch is involved, the clinical phenomena of which we shall shortly describe. But the point which we wish to lay stress upon at this juncture is that if the fasciculi of the *internal popliteal* alone be damaged a definite *causalgia* ensues—the existence of pain in injuries of the sciatic trunk being proof positive of the special involvement of these particular fibres.

As in the *median* nerve, there develops a *causalgia* of inveterate type which is definitely paroxysmal, but the persistence of which is not so protracted as in the former. The *objective* sensory disturbances chiefly take the form of hyperæsthesia of the internal and hypæsthesia of the external segment of the sole. If there be, as is common, an associated lesion of the *external* popliteal fasciculi there may be total anæsthesia over the skin supply of this as well as of the internal popliteal branch.

Because of its important bearing on evaluation it may be observed that, as in median causalgia, there may be here also an aftermath of *articular* complications chiefly involving the ankle joint.

### *Fallacious Signs of Recovery*

The sciatic nerve is responsible for the innervation of the *dorsiflexors* of the ankle. Now the contractions of the *extensor quadriceps* are readily transmitted to the *aponeurosis of the leg*, and the hardening thereof may be wrongly attributed to contraction of the *dorsiflexors of the ankle*. Consequently, in endeavouring to ascertain the recovery or not of these same the *knee should be fixed*, and in this way a source of fallacy excluded.

### *Signs of Impending Recovery*

Before the return of *motor power*, which usually sets in *abruptly*, signs indicative of reviving *sensory* and *motor irritability*, such as

tingling in the calf and foot and muscular twitching, manifest themselves. But only immediately prior to the actual regaining of motility do the *objective* sensory defects disappear.

Muscular *tonus* to a limited degree reasserts itself before muscular *contractility* revives. But not until *voluntary* motility is definitely reacquired does muscular tonicity reach the normal level, and with its re-establishment the foot-drop and flaccidity of the toes tend to diminish.

The *order* in which the individual muscles recover is not distinctive, as in the case, for example, of the *musculo-spiral* nerve. The peronei, tibialis anticus, or gastrocnemius may, any one of them, be the first to recover, and exceptionally the tibialis posticus anticipates all three. But if it be uncertain as to which muscle will recover first, there is no doubt as to which group will be the last to regain motility—viz. the *flexor or extensor muscles* of the toes.

### *Tests for the Recovery of Individual Muscles*

To avoid erroneous deductions it is well that certain precautions be taken. If it be the *peronei* that we are investigating, the patient should be placed in the recumbent position—the heel of the affected foot resting on the bed, and the toes pointing upwards.

To assure ourselves as to whether or not the *tibialis anticus* is regaining motility, we should adopt the following plan: The physician forcibly flexes the paralysed foot on the leg. He then exhorts the patient to maintain it in that pose. This he may be able to do for a few seconds, during which the tibialis anticus may be seen to contract.

In the case of the *gastrocnemii* the patient should adopt a sitting posture, with the knee bent and the plantar surface of the foot resting on the ground. He should then be directed to raise his heel, the examiner meanwhile palpating the calf muscles with both hands. Should these muscles then be felt to harden it may be taken as a sign of impending recovery.

### *Evidences of Complete Recovery*

In severe lesions of the sciatic nerve, years elapse before complete functional restoration ensues. This at any rate is but too true of cases of *complete* anatomical division. Professor Pitres lays stress on the following tests as indicative of the complete restoration of functional efficiency:

(1) The patient should be capable of alternately balancing himself on his heels and toes while standing with his feet close together on the ground.

(2) He should be able to beat a measure in common time with the injured foot.

### Factors in Evaluation

Given *complete anatomical or physiological block* of the sciatic trunk, there straightway ensues *total* paralysis of all the muscles of the leg and foot. The foot drops and is immobile, a typical steppage gait develops, the knee in walking being unduly raised, recalling the mode of progression affected by a horse fflicted with "string-halt." The man cannot stand on the heel or toes of the paralysed foot, and to run is impossible. If the lesion be situate nigh the buttock he is still further disabled. He may be wholly unable to flex his knee, or, what is more common, the power of flexion thereof may be much impaired. The muscular atrophy, always masked by coincident œdema, brings in its trail deformities—notably *club foot.* The limb's temperature is lowered, it becomes violaceous in colour, and œdema is often present. The *sensory* troubles are very variable, and of not great *functional* importance. We see, therefore, that severe injuries of the sciatic trunk, by reason of the complete palsy of leg and foot entailed, occasion *absolute incapacity.*

Again, in the *causalgic* types the man, *qua* the *pain,* is placed *hors de combat,* and pending its cessation he likewise is wholly incapacitated. Recovery in his case, though protracted, is, however, probable, but the duration of his disability may be prolonged by reason of *articular* complications or *involuntary muscular movements.*

### *Assessment*

As to the estimates formed of the *resultant incapacity* in total paralysis of the sciatic trunk there are but few recorded instances. Assuming that the *total* paralysis is *irremediable,* then clearly a high indemnity, from 60 to 70 per cent., is but fair. Imbert is of opinion that in paralysis due to *complete section* of the *main* trunk, with muscular wasting, flat-foot, etc., 60 per cent. is not excessive—a conclusion few will gainsay. Personally we consider that the average indemnity accorded in cases after suture, primary or secondary, is somewhat low—viz. 40 per cent. We are strongly of opinion that pending a substantial degree of recovery of motor power the incapacity in such cases should be assessed at from 50 to 60 per cent. As far as the man himself is concerned, the fact that *suture* has been performed does not spell *immediate reduction of functional incapacity.* He is for the time being equally disabled whether suture has or has not been performed. His condition is *actually* unaltered, but *potentially* improved. When, however, he has reached the stage when the *dorsal* or *plantar flexors* of the ankle, either one or both, have recovered *voluntary motility,* we may then with some show of justice rate the incapacity at 30 or even 20 per cent.

Lastly, should the functional disabilities occasioned by paralysis of this nerve prove irremediable by neurorraphy or neurolysis, and yet admit of amelioration by *tendon fixation* or *arthrodesis*, then the final assessment should be postponed until the results thereof can be appraised, and the assessment of the residual incapacity possibly lowered.

*As to the causalgic types* in their early stages, in our opinion 70 per cent. is but reasonable. For apart from incapacity we have here the added factor *grievous suffering*, and which, moreover, we can do little to alleviate. With the passing of the pain, however, our assessment must rest on the measure of the *residual disabilities*—the ankylosis or involuntary movements. The inconvenience entailed calls for a continued indemnification, the amount of which will vary according to the degree of the said disabilities. If the *ankle* be totally or partially ankylosed, what is *the angle of fixation, the arc of movement retained*—favourable or unfavourable ? If in a *bad* position, 30 to 50, if in a *good*, 15 to 20 per cent. will, we think, fully represent the incapacity entailed. On the other hand, in mere limitation of mobility even when the *arc of movement* retained is most *unfavourable* (equinism), 20 to 30 per cent. according to its degree will be approximately an adequate estimate of the disability entailed.

## External Popliteal Nerve

During the South African War the external popliteal nerve was stated to be involved nine times as frequently as the internal popliteal branch, but in the present war the proportion is stated to be 3 to 1.

### *Chief Clinical Phenomena*

Lesions of this nerve below the *bifurcation* of the sciatic trunk may result in complete or incomplete paralysis.

*Complete Variety.*—In this there is immediate and widespread paralysis of all the muscles supplied by the nerve below the lesion. The motor disabilities occasioned are as follows : complete loss of the power of dorsal flexion of the foot, as also of extension of the proximal phalanges of the toes. To this is superadded loss of the power of eversion of the foot. Foot-drop ensues —sometimes even of more pronounced grade than in lesions of the sciatic trunk. Atrophy of the muscles on the front of the leg rapidly develops, and the same show a complete reaction of degeneration.

*Subjective Disturbances of Sensibility* are rare, and are usually attributable to associated lesions of the bones and ligaments. But in some cases such are due to a correlated lesion of the *internal popliteal* branch or to secondary involvement of the same in the scar-tissue of the original wound.

On the other hand, the *objective sensory changes* are well marked—viz. anæsthesia of the dorsum of the foot up to the base of the toes. Laterally, too, the insensitive area extends from the fifth metatarsal across to the inner border of the foot. The anæsthetic zone, moreover, extends upwards over the lower third of the outer surface of the leg, and merges at its margins into a zone of hypæsthesia of variable extent.

*Incomplete Variety.*—Lesions of this nature are exceptional, and usually due to direct injury of one or other of the branches running to individual muscles. It may be a lesion of the *anterior tibial* nerve with resultant paralysis of the tibialis anticus and the extensors of the toes. This leads to pronounced abduction of the foot—accentuated through functional over-action of the peronei—while *sensory* disturbances ensue in the first dorsal interosseous space.

### *Fallacious Signs of Recovery*

Before we proceed to investigate the recovery or not of the affiliated muscles the *knee* should be rendered immovable, this to prevent the transmission of muscular contractions in the thigh (quadriceps extensor) to the aponeurosis of the leg. Otherwise the sudden tension occasioned in the latter may be wrongly interpreted as evidence of active contraction on the part of the *antero-external* group of muscles. It is also essential that we establish the *identity* of the muscles, this by palpating their tendons at the ankle joint. Otherwise, we are only too likely to be led astray by the contraction induced in *contiguous but unrelated* muscles. If the knee be *fixed* and the ankle can be *dorsiflexed*, then it must be due to the action of the *tibialis anticus*. This, of course, refers to pure dorsiflexion unmixed with *adduction*, in which case it is the *tibialis posticus*, not the anterior tibial muscle that is responsible.

Again, in investigating the condition of the *extensors of the toes* we must be mindful of the action of the *interossei* muscles. These extend the *last two* phalanges, and the movement might readily be misconstrued as one of *extension of the toes*. But we should, to avoid such misconception, recollect that the *basal* phalanx is unaffected by their action, and that consequently the extensor tendon does not project as in this movement when normally executed. Possessed of this knowledge we can readily differentiate extension of the *toes* from that of the *two terminal phalanges*.

Lastly, *pure abduction* of the foot by the peroneal muscles being impossible, we must be alive to the fact that the subject when asked to abduct his foot may enlist the action of the *calf muscles* to effect this movement, which in this instance is accompanied by *depression of the point of the foot*. Consequently, if

during the performance of this manœuvre the peroneal tendons be palpated, we detect no hardening such as would be present in *pure abduction without plantar flexion.*

### *Signs of Impending Recovery*

As to the *initial* genuine signs of recovery these need not be looked for pending the lapse of some months after the receipt of injury. Pain on pressure of the nerve trunk below the lesion, or on pinching the skin in the area of sensory supply, is the first to transpire.

While exceptionally the *peronei* are the first to regain voluntary motility the muscles generally recover in the following order : first the tibialis anticus, then the peronei, and lastly the extensors of the toes.

The associated *foot-drop* does not disappear immediately on the return of *voluntary* power—this owing to the associated overstretching of the ligaments. Hence the subject still affects a steppage gait.

As to the signs affirmative of *cure*, a considerable period must elapse before these can be elicited. Mme. Benisty states that she has not seen such become manifest in serious lesions, not even after twenty months have elapsed. As to the methods demonstrating *complete cure*, the tests enlisted for the same purpose in lesions of the sciatic trunk are applicable, and for these we would refer the reader to a previous paragraph.

### Factors in Evaluation

The external popliteal is the homologue of the *musculo-spiral* in the arm, and we may remind ourselves that it supplies muscles which act *against* the pull of gravity. So it happens that indifferently in complete or incomplete lesions, paresis or paralysis of the extensor muscles ensues with *foot-drop*. The conditions, moreover, are *unfavourable to recovery* because of this same action of gravity. For under the influence of the latter the muscles, far from being relaxed, are constantly *overstretched*. Hence, *spontaneous* recovery is out of the question, and can only be looked for when appropriate treatment is forthcoming.

Now the incapacity entailed by paralysis of the external popliteal is very real owing to the *foot-drop* and *associated steppage gait*. It is, as before remarked, an exaggerated steppage gait that is here displayed. So much so, as Mme. Benisty states, " the subjects prefer to walk with crutches until they are made to wear a prosthetic apparatus correcting this attitude of the foot." The disability occasioned gives point to one of Duchenne of Boulogne's aphorisms. Quoth he, " It is better to lose all the muscles of the foot and leg than to keep some of them only."

Again, the foot cannot be *abducted* and the patient cannot walk on the heel of the paralysed side, nor because of his foot-drop can he run, and when on tiptoe he finds it difficult to maintain his balance. To this must be added that extension of the proximal phalanges of the toes is impossible. Furthermore, we cannot overlook the *objective* changes that eventually ensue in the foot—the relaxation of the ligaments of the ankle, the marked projection of the tarsal bones, which together with the thickening of the extensor sheaths constitutes an unsightly swelling on the dorsum of the foot.

*Assessment*

Reflection on the various disabilities that follow *total* paralysis of the external popliteal branch leads us to consider that the estimates of the incapacity entailed, both by German and French authorities, especially the former, are somewhat low. Thus German experts rate it at 10 to 15 per cent., with which finding Remy, by the by, is in accord. The French "Guide Barème," however, rates the incapacity in this lesion at 20 per cent., holding apparently that the possibility of its amelioration by surgical measures or a prosthetic apparatus justifies this low rating. While, however, the wearing of an apparatus may diminish the disability, we must not forget that the wearing of the apparatus is irksome. None will gainsay that however efficient the same may be it is but a poor substitute for loss of the capacity to dorsiflex the ankle. Frankly speaking, we consider that the incapacity in *total* paralysis of the external popliteal should be rated at not less than 30 per cent. Imbert, we may remark, cites Golebiewski as granting in one example as much as 40 per cent. Certainly this latter estimate would not be excessive if there were superadded to the external an *incomplete lesion of the internal popliteal*—this because of the associated *pain*.

Lastly, should the functional disabilities occasioned by paralysis of this nerve prove irremediable by neurorrhaphy or neurolysis, and yet admit of amelioration by *tendon fixation* or *arthrodesis*, then the final assessment should be postponed until the results thereof can be appraised, and the assessment of the residual incapacity possibly lowered.

As regards *incomplete* lesions of the external popliteal it would possibly be reasonable to assess the incapacity at 20 per cent.

## Internal Popliteal Nerve

Only rarely do we encounter an *isolated* and *total* paralysis of this nerve, whether due to a lesion below the bifurcation or to one involving the related bundle of the sciatic trunk. Most frequently we meet with an *incomplete* paralysis of this nerve

occurring in association with a *more or less complete paralysis* of the *external popliteal* branch.

*Chief Clinical Phenomena*

*Complete Variety.*—Complete anatomical section of the internal popliteal is exceptionally rare, but complete *physiological* interruption from less serious lesions of the nerve results in the following disorders: Owing to paralysis of the gastrocnemii plantar flexion of the ankle is impossible, while in consequence of the involvement of the tibialis posticus adduction of the foot can no longer be compassed. The intrinsic muscles of the foot, moreover, are wholly inert, and flexion and lateral movements of the toes abolished. Moreover, if the lesion be actually situated high up in the sciatic trunk, the *hamstrings* are likewise put out of action. The reaction of degeneration can usually be evoked in the intrinsic muscles of the foot and those of the calf, while of course the ankle jerk is abolished.

Unlike the trophic, the *sensory* changes, more especially those of an objective character, are marked and characterized by anæsthesia of the sole, save its inner border, likewise the plantar surface of the toes. Occasionally such extends to the dorsal surface of the terminal phalanges, the outer border of the foot and the region of the heel reaching up as far as the insertion of the tendo Achillis.

*Incomplete Variety.*—This is important by reason of its *frequency.* In other words, the lesion of the internal popliteal most commonly met with is a *partial* or *dissociated palsy,* and this *in association with a complete or incomplete paralysis of the external popliteal nerve.* The salient clinical characteristics are a neuralgia of the calf and ankle, a definite causalgia of the sole, and the associated foot-drop.

*Posterior Tibial Nerve.*—In the few examples we have met this has been due to wounds in the calf. The paralysis may be *complete* or *incomplete,* involving all the plantar muscles or only some of them. In addition there may be pain, neuralgic in character, localized in the plantar region, and disabling in its intensity, while the profuse sweating in the related nerve area adds to the discomfort of the patient.

*Fallacious Signs of Recovery*

In the internal popliteal nerve, as in lesions of the sciatic trunk, care must be taken to assure oneself that any movements performed originate in the damaged muscles and are not to be referred to the action of *auxiliary* or *antagonistic* muscles—viz. *substitution.* Thus simple adduction *without elevation of the foot* is impossible save when the *tibialis posticus* is intact. Conse-

quently, if the subject be asked to adduct his foot, and the same coincidently undergo elevation, it must be attributed, not to the tibialis posticus, but to the *anterior tibial* muscle.

Again, a return of power in the *flexors of the toes* must not be too readily assumed. For if the extensor muscles be suddenly strongly innervated, with consequent *hyperextension of the proximal phalanges*, a spurious flexion of the toes may ensue on relaxation of the extensor muscles. If care has been taken to avoid the above fallacies, then *cure* may be considered as established if these particular movements can be performed.

### Factors in Evaluation

The internal popliteal, as T. E. Hammond in a recent study observes, supplies muscles the action of which is *reinforced by gravity.*

Accordingly, lesions of the internal popliteal do not entail the same disability as those of the external popliteal. In other words, they *do not occasion foot-drop.* Nevertheless, the normal resilience of the gait is diminished, and with this lesser inconvenience they are, of course, saddled.

In *incomplete* division Hammond notes a slight *pes cavus* may develop. Lastly, we see that in lesions of the internal popliteal the action of gravity, inasmuch as it prevents overstretching, favours the advent of *spontaneous* recovery, an ideal that cannot be hoped for in the case of the *external* branch, in which the muscles are continually being over-extended by the same force. In *combined lesions* of these two nerves, if the pain be subdued the *associated foot-drop* occasions the main disability unless there be, as before remarked, sequelæ in the shape of *ankylosis*, involuntary movements, etc.

### *Assessment*

It is somewhat noticeable that as far as we have been able to ascertain there are no recorded estimates as to the incapacity entailed by complete or incomplete paralysis of the *internal* popliteal. While we may predicate *absolute incapacity* in the *causalgic* forms as long as pain endures, it must be admitted that with its cessation but slight inconvenience is occasioned. The inelasticity in the gait is hardly a grave disability. It should not, we think, be rated at beyond 20 per cent.

## Anterior Crural Nerve

Lesions of this nerve trunk and its branches are fortunately rare. The main trunk may be injured in wounds of the groin, thigh, or pelvis.

### *Chief Clinical Phenomena*

Should the nerve be injured before it leaves the abdomen, the *iliacus* muscle may be paralysed and the power of flexing the thigh diminished. More commonly there is loss of power of *extending* the leg through paralysis of the *quadriceps*, while to this may be added difficulty in adduction if the nerve to the pectineus be involved.

Wasting of the muscles of the thigh, notably the vastus internus, with abolition of the knee jerk, quickly ensues.

Neuralgic phenomena and objective disorders of sensibility are usual accompaniments. The former are localized chiefly to the path of the internal saphenous, the latter delimited to the anterior and inner surface of the thigh, leg, and internal margin of the foot, taking the form of hypæsthesia and hyperalgesia.

### Factors in Evaluation

In *complete* lesions the disability entailed is serious, as the nerve supplies the extensors of the knee. Although not used in standing, the quadriceps extensor in *walking* straightens out the advancing leg just prior to its receipt of the weight of the body. But when the *extensor* is paralysed, the subject when walking seeks to avoid *flexing* the knee lest he be unable to straighten it again. Moreover, to prevent its flexion by the body weight, he keeps his knee straight when walking, takes short steps, and inclines his trunk forward on the affected side. Needless to say, too, a person so afflicted finds difficulty in rising from a kneeling posture or in descending stairs. Walking, too, against a high wind is for them somewhat hazardous, owing to their increased liability to fall backwards. The salient feature in these cases is that even after the recovery of voluntary motility they walk *lame* for a considerable period owing to *persistent weakness of the knee.* This latter is due, not so much to the paresis of the extensors, which may indeed have recovered, but to lack of the *normal degree of tension in the aponeurotic coverings* which ordinarily confers stability on the knee.

### *Assessment*

Having regard to the above disabilities it appears to us that the incapacity entailed through *total* paralysis of this nerve should be assessed as highly, if not higher, than a corresponding lesion of the *sciatic* trunk—namely, from 50 to 60 per cent. German awards vary from 66 to 85 per cent., but Imbert, who regards these as excessive, rates the resulting depreciation in working capacity at 40 to 50 per cent., figures adopted also by the French "Guide Barème."

## CHAPTER XXII

# LESIONS OF MUSCLES AND TENDONS

### Muscular Atrophies

THE specific function of muscle is *contractility*—this inherent attribute of the musculature endowing the bodily frame with all its manifold capacities of movement. Mobility being achieved through the agency of the *muscles*, it is obvious that disabilities therein will prejudice to a variable degree the *working efficiency* of the limb.

It is with this aspect of muscular lesions that we are primarily concerned—namely, their influence on *physiological* or *functional* capacity.

*Upper Limb*

*Wasting* of the muscles may be localized to any portion of the extremity—the shoulder girdle, arm, forearm, or hand. Or its manifestations may be more diffuse—implicating one or more of these muscle groups. As a rule the muscles responsible for the movement of a limb segment take origin in that *proximally* related thereto. Thus no muscles, but *tendons only* exist in the fingers—the swift and complex activities of the digits being achieved, for the most part, by the *forearm* muscles. Those of the *wrist* likewise come under their sway. Again, the excursions of the *forearm* on the *arm* are attained through the action of muscles attached partly to the arm, partly to the forearm. Lastly, these topographical relations in the *shoulder* are more intimate—its mobility being derived from the closely encompassing muscles that spring from the shoulder girdle.

In general the action holds good that the muscles of a limb—condemned to inactivity or seldom in use—undergo atrophy and loss of tone. The malign effect of prolonged *immobilization*, though often unavoidable, on the muscular structures has been brought home to us very painfully in regard of war-wounds. But apart from *disuse atrophy*, the wasting of the limb muscles may be the outcome of *disease* or *injury*—located in the *muscle substance itself* or of *secondary* origin, referable to morbid processes, traumatic or other, in related parts, e.g. the *nerves* or *joints*.

Still, concerned as we are with the *functional consequences* of muscle atrophy rather than with its causation, we will in the matter of its *œtiology* merely allude to those peculiar types with which the circumstances of war have familiarized us.

Thus, dealing with *war wounds*, the attention of Claude, Vigoroux, and Lhermitte was arrested by a type of muscular wasting, consecutive to *bullet* or *shell wounds*. It was noticeable that the track of the missile stood in no direct relation to the *distribution* of the atrophy. In the peculiar variety under consideration the atrophy was usually localized to the *shoulder girdle*, the wasting and weakness chiefly involving the trapezius and serratus magnus, the response of which to electrical stimuli is diminished, but *not* qualitatively altered. Sensory changes are absent, and nothing in the topography or character of the atrophy suggests any nervous lesion. Nor is there any concomitant bony or articular disorder capable of explaining it on a reflex hypothesis. It is, so the authors deem, a *non-progressive* localized muscular dystrophy of *traumatic* origin—probably exerting its effect through *nutritional* disturbances.

Reverting now to another variety. Broca, as we pointed out in our section on "Fractures," has noted the incidence of a *progressive sclerosing myositis* developing in the wake of bullet wounds in the muscles. Induration and atrophy of the whole muscle may follow simple piercing of the same by the projectile. It ensues indifferently whether suppuration or not has supervened, but in the presence thereof is more pronounced in degree. It develops, moreover, independently of any *bone* or *nerve* lesion.

For the rest, we should not omit to emphasize the muscular atrophy associated with *joint disorders*. Given static lesions of this nature, with their correlated call for prolonged immobilization, it is not surprising that muscular wasting should transpire. But what of a *dislocation of the shoulder* which, though reduced almost immediately, is yet followed by *muscular atrophy*? What, too, of those instances in which after simple *contusion of shoulder* or *knee* the same phenomenon develops? Surely here some trophic factor is at work. Lastly, allusion must be made to the wasting of the muscles of the forearm which so swiftly follows *infections*—purulent or non-purulent—of the palm of the hand.

### Factors in Evaluation

Voluntary contractility is the criterion of efficiency in skeletal muscles, and now comes the question, To what extent can we appraise the influence of muscular atrophy in depreciating functional capacity?

Several factors must be taken into consideration if we would arrive at an intelligent conclusion : (1) the identity of the muscle or muscles ; (2) the measure to which their action can be compensated for by other muscles ; (3) their volume and consistency ; (4) the nature of their electrical reactions ; (5) the duration of the atrophy.

(1) *Identity.*—The degree of the *resultant incapacity* must clearly depend to a great extent on the *functional* importance of the muscle or muscles implicated. To take a salient instance, *loss* of the *serratus magnus* may enfeeble certain movements, and so may *atrophy* thereof. But in neither instance does it result in *abolition of any particular movement.* How different the effect of lesions in the *deltoid* ! In paralysis thereof *abduction* of the arm is almost lost, and how seriously is its performance prejudiced by simple *wasting* of the same ! Pursue the matter further, as one must in *compensation* cases, and consider the *identity* of individual muscles in relation to particular *vocations.* The quondam clerk whose *infraspinatus* is weakened by a bullet wound, how difficult for him to *write* through loss of the power of *rotating* his humerus ! What, too, of the military chaplain or *beau sabreur* if his *pectoral* muscle be pierced by bullet ? The former cannot raise his hand in benediction, the latter can no longer " cut " with his trusty blade. But if these disabilities are attributable to wasting and weakness of the *upper* part of the pectoral muscle, atrophy of its *lower* fibres also brings alike its own peculiar disability. Thus the raised arm cannot be lowered against even a slight resistance. As Duchenne graphically observed : " The blacksmith thus disabled may wield his hammer, but cannot blow his bellows by downward pull on its cord."

Again, of the muscles of the *forearm,* weakness and wasting of the *long radial extensor* is more incapacitating than of the ulnar extensor. This because in that most necessary action—transference of the hand to the mouth—it is the former with its radial lateral movement that is enlisted. In industrial workers, too, the impaired strength of the *supinator* is more serious than that of the pronator muscles.

Turn to that delicate criterion of capacity—the *hand.* What of the clerk if his *abductor brevis* be wasted ? How seriously compromised is his aptitude for *writing* ! The same, too, if his *flexor longus pollicis* be disabled. No longer can he make a stroke with a pen towards the body. But far less serious his plight if it be his *extensor secundi internodii pollicis.* For then he is unembarrassed in writing, unconcerned as this muscle is with the essential movement of extension with opposition.

In conclusion, no sharp differentiation in *functional* importance

can be drawn between the *flexors* and *extensors* of the hand. At first sight it might seem that in industrial workers the former group is the more important—the more essential for grasping of tools and other objects. But recall the victim of *musculo-spiral* paralysis, and how plainly we see that the *antergic* contraction of the extensors is necessary to bring out the full powers of the flexor muscles. Vice versa in paralysis of the flexors, extension of the wrist is unsteady through loss of the balancing action of the flexors.

(2) *Compensatory Action through Substitution.*—Owing to the beneficent circumstance that, not one, but several muscles may subserve the performance of a particular movement, it follows that the atrophy of one muscle may to a certain extent be compensated for by the intervention of its auxiliaries. Thus weakness and wasting of the *supraspinatus* is compensated for by excessive innervation of the deltoid. Again, loss of power in the clavicular part of the *pectoralis major* is immaterial, for the anterior fibres of the deltoid execute the same action. Isolated palsy of the *brachialis anticus* has but little effect as its metier—*elbow flexion*—is subserved by the biceps and supinator longus. Again, in true abduction of the thumb, if its performance be compromised by wasting of the *extensor primi internodii pollicis*, the same is relatively unimportant. It can be compensated for so considerably by other muscles. Again, even if all the thenar muscles are weakened, objects can still—thanks to the *adductor pollicis*—be gripped between the side of the thumb and palm.

This substitution of lost or reinforcement of weakened movements by ancillary muscles is but another example of *functional adaptation* to the consequences of disability. As we see, these in some instances may almost totally compensate for the wasting with associated weakness of isolated muscles. At the same time such substitution has its limits, and is probably rarely if ever perfect, though a source of distinct amelioration.

(3) *Volume and Consistency.*—If the faculty of voluntary mobility is to find adequate expression, the volume and consistency of the subserving muscles must be unimpaired. This, however, broadly speaking only, for given muscular masses of *equal bulk* it does not necessarily follow that the same are of *equivalent functional capacity*. Unfortunately, too, we still lack the means wherewith to estimate the actual functional significance of varying *grades of muscular wasting*. We have, therefore, to take our stand on the general axiom that, *ceteris paribus*, wasted muscles are *functionally* less efficient than those normally constituted. Also that the more intense the degree of their atrophy, the more pronounced their deficiency in this respect. Wasting,

to be appreciable, must entail an actual diminution in the *circumference* of the limb—the contour of which in high grades thereof is considerably altered. The fallacies which beset the actual technique of *mensuration* we have in a previous chapter on "Fractures" (General Principles of Evaluation) discussed in detail. It is unnecessary, therefore, to recapitulate our conclusions, and we would refer the reader thereto. Here, however, we would interpolate the results of some pertinent researches by Continental observers. In drawing deductions from mensuration as to the existence or not of atrophy, it must be recollected that the *right*, or more correctly speaking the *active*, limb is normally of greater circumference than its fellow. Masini and Dugas have determined the following facts: Out of 209 right-handed men the *right* hand was found stronger than the left in 174 (83 per cent.); in 16 the *left* was the stronger (8 per cent.); in 19 both arms were *equal* (9 per cent.). Of those whose *right* arms were larger than their left the average difference in circumference betwixt the twain was six to seven millimetres. Lastly, in all the *left-handed* persons the *left* arm was the larger of the two.

The conclusions arrived at by Rawitsch in similar investigations were much the same. Of 500 soldiers in normal health he found the *two arms equal* in 27 per cent. In 3 per cent. the *left* arm was the larger, and in the remainder the average circumference of the *right* exceeded that of the left by six millimetres. It may be observed, too, that Imbert has noticed a curious fact—at present inexplicable—that in some *right-handed* individuals the *left* arm is the larger.

To sum up, it is clear that in deductions from mensuration the normal disparity in girth of the right and left arms—in other words, the active and passive limbs—must not be lost sight of. We would also agree with Imbert that it is permissible to deduce the existence of atrophy if the disparity between the active and passive limbs equals *one centimetre or more*. It would not, he thinks, be justifiable to infer the same if the difference were less. Given these reservations, the results of *mensuration* may be regarded as trustworthy. This, however, only if care be taken to avoid other sources of fallacy. Thus it is most important to exclude the co-existence of *œdema*, or if a fracture be present the *overlapping of the bones*. But more interesting and more fallacious still is that trophic phenomenon known as *subcutaneous adiposity*. In our work on "Fibrositis" we pointed out that it is "of the nature of a local obesity, an increase in subcutaneous fat" which may extend over the whole limb or be confined to one or other segment thereof. "The proliferation of the adipose elements in the

cellular tissue and skin of the diseased limb may, in our experience, proceed to such an extent as to mask entirely the underlying muscular atrophy, and it may indeed result in the diseased limb being larger in circumference than its fellow. This thickening of the panniculus adiposus can be appreciated by pinching up a fold of skin and comparing it with that of the unaffected limb." This hyperplasia of the subcutaneous tissues we have met with in lesions of the *sciatic nerve* and also reflex *arthritic muscular atrophy*. It is therefore essential when carrying out mensuration to bear in mind this possibility, as otherwise we may overlook a *coexistent wasting* of the subjacent muscles.

(4) *Electrical Reactions*.—The reliance formerly placed on the *dynamometer* in gauging the efficiency of muscles has been largely discounted because of the many fallacies attaching thereto. Apart from the fact that we are at the mercy of the subject, who may or may not exert his full strength, we have the further factor, the relative painfulness evoked by strong attempts at gripping the instrument. As Imbert remarks, a *painful* effort will always be less powerful than a non-painful effort even if the muscles in action are of the same value. Accordingly, in attempting to estimate the actual *functional* efficiency of *wasted* muscles, electrical examination is essential.

Now the significance of muscular atrophy in sequence to *direct nerve lesions* has been considered in the chapter on "Nerve Injuries." Here we are concerned with *direct lesions of the muscles* and also *reflex traumatic muscular atrophy of articular origin*. As to *direct* lesions by bullet wounds, the muscle may undergo *total sclerosis* of its substance, but this is exceptional. In the majority of instances it is *partial*. Now in this variety, as in reflex muscular atrophy, it is not a question of eliciting the *reaction of degeneration*. This is *not* present, and accordingly will not be evoked. All we may expect is a *diminished excitability* of the wasted muscle to *faradism*. The muscles of the uninjured limb being usually available as a control, the degree of the diminution may be estimated by comparison therewith. Last, but most important, it is highly essential that we invariably take steps to exclude or take cognizance of any *functional* element in the case under review.

(5) *Duration*.—Upon this point, important though it be, there is much need for expansion of our knowledge. Generally speaking it is conceded that given massage of the wasted muscles, and the resumption of exercise on their part, the atrophy will disappear. On the other hand, it must be admitted that in *long-standing* injuries, though the *wasting* to a certain extent may be diminished, it does not usually disappear wholly—as is demonstrable by *men-*

*suration*. Accordingly it must be admitted that *persistent atrophy* entails some measure of *permanent incapacity*.

### *Assessment*

In the evaluation of muscle injuries the important therapeutic rôle played by a *timely resumption of work* in functional restoration of the same must not be lost sight of. In other words, we should carefully avoid *over*-assessment of such cases. This perhaps especially in *reflex arthritic muscular atrophy*. On the other hand, in those graver dystrophies of the type described by Claude and his colleagues, as also in those still more serious examples of *progressive atrophic* sclerosis of muscles described by Broca, the assessment should of course be more generous. In *reflex muscular atrophy of articular origin* the French "Guide Barème," following in the wake of Remy and Imbert, cites the following figures :

| | Active limb | Passive limb |
|---|---|---|
| Atrophy of muscles of the shoulder | 5 to 20% | 5 to 10% |
| „ „ „ arm | 5 to 30% | 5 to 20% |
| „ „ „ forearm | 5 to 30% | 5 to 20% |
| Atrophy of the thenar muscles | 5 to 10% | 0 to 5% |
| Total atrophy of the upper limb | 60% | 50% |

With these findings there is little to cavil at, especially in a *physiological* as opposed to a professional evaluation. When, however, the particular muscle group is one the vigorous action of which is essential for the pursuit of the employment, the legitimacy of an increase is to our mind palpable. It is for the purpose of assisting in the assessment of such cases that we introduced our remarks on the *functional value of individual muscles in relation to particular vocations*, and the extent to which their diminished action can be reinforced or compensated for by ancillary muscles. All these factors must be taken into consideration in estimating their significance in a *professional* sense to the victim. For the purposes of *military pensions* we think that the figures cited above form a reliable guide in *reflex muscular atrophies*. On the other hand, in the *muscular dystrophy* of Claude, as also in the *progressive atrophic sclerosis* of Broca, considerable elevation is called for. Thus in the former, in a well-marked case in the *muscles of the shoulder*, the assessment of the resulting disablement might be raised in the right to 30, in the left limb to 20 per cent. In the same way the latter, according to the *identity* of the muscle and the *extent* of the morbid process, whether total or partial and attended by retraction with secondary deformity, would demand even higher figures. That we in no way overestimate the gravity and persistence of the disablement produced

by *atrophic sclerosis with retraction* is clear when we have regard to the fact that in the forearm the shafts of the radius and ulna, according to Broca, may have to be *shortened* to adapt them to the retracted muscles.

### *Lower Limb*

The general considerations advanced in respect of muscular wasting in the upper limb apply also to the lower extremity. But one salient distinction, functionally speaking, emerges—viz. that *solidarity or stability* is the chief desideratum in the leg as opposed to *mobility* in the upper limb. We must, therefore, weigh the relative functional value of the various leg muscles in light of the part played by them in upholding the body weight—in assuming and maintaining the erect posture both in standing and walking. To elicit this information we must discuss those same factors that in this connexion engrossed our attention in regard to the muscles of the upper limb. For the deductions drawn from our findings in this respect would constitute the basis of our attempt at assessment.

### Factors in Evaluation

(1) *Identity of the Muscle.*—The varying functional values of the leg muscles swiftly recur to the mind on reflection. Thus for *hip flexion* the integrity of the *psoas* is indispensable and irreplaceable, and the same is true of the *vasti*—the extensors of the knee. How relatively unimportant the functions of the *sartorius*, the *plantaris*, the *popliteus*, the *crureus* !

Obviously the muscle group most concerned in the assumption and maintenance of the erect position, when standing and alike in walking, is the *quadriceps extensor cruris*. How essential its rôle therein is graphically illustrated when this great muscle—following fracture of the *patella*—is thrown out of action. Similar disabilities, though of course less pronounced, follow *wasting* and *weakness* of the *extensor group* of muscles. Thus the stability of the pose when erect is lessened, because the knee is less firmly fixed in extension. In like fashion in walking the leg tends to give under the body weight when the subject attempts to rest upon it. If the paresis be very marked, the subject, when rising from a sitting posture, rests his hand upon the knee so as to bring " the centre of gravity of the body near the fulcrum of the lever formed by the femur." The power of rising from a kneeling position is enfeebled, as also the ability to take and relinquish a squatting attitude—a disability brought home to them in the act of defæcation. Similarly the victim is hampered, not so much in mounting as in *descending* stairs or ladders, menaced as

he is by the constant danger of the leg giving way under the body weight. The fact that the difficulty figures more prominently in *descent* rather than ascent has been made use of to unveil simulators, who are prone to fall into the fallacy that the reverse is the case. Hence they dilate on the difficulty they find in *ascending* stairs or ladders.

The *professional* significance of wasting and weakness in this particular muscle group is very emphatic. The mason, the plasterer, the painter may perhaps have to abandon his former occupation. If he persist therein, consider how marked his disability, his liability to sudden falls! In short, his *physiological* incapacity entails great impairment of working powers—corresponding depreciation of his value in the industrial market.

Turning now to marked wasting and weakness of the antagonist group—the *flexors* of the knee. Here again the victim stands at a great disadvantage. The weakened power of flexion interferes with walking, since "the knee cannot be bent in the forward movement of the leg until the thigh is flexed sufficiently to permit the weight of the foot to flex the knee." But before passing to the *muscles of the leg* it may be remarked that in the present war many unfortunate men have had to realize painfully the effects of wasting in the *gluteus maximus*—secondarily to wounds with loss of substance or atrophy thereof. The muscle, it is true, does not come into play in standing or walking on *level* ground, but how different if the surface be uneven! Again, how it irks them to go upstairs or uphill, or to rise from a chair!

Coming to the *leg*, wasting of the *dorsi flexors*, through the tendency to *foot-drop*, is more incapacitating than atrophy of the plantar flexors. This difference is largely due to the fact previously alluded to—viz. that the foregoing group, the dorsi flexors, unlike their opponents, have constantly to work *against* the pull of gravity. Hence also the attitude adopted in progression, the *steppage* gait.

(2) *Compensatory Action through Substitution.*—In the lower extremity the power of compensation by substitution of the action of *auxiliary* or *antagonistic* muscles is still exhibited, but in a far less striking manner. Thus in the *psoas* no such ancillary aid is forthcoming. Given marked weakness thereof, the power of *flexing the hip* is diminished, and the use of leg in walking rendered difficult, if not impossible. Again, when we turn to the extensor of the hip—the *gluteus maximus*—the only possibility of compensation for its weakness is a *postural adaptation*. To minimize the tendency to bend forwards in walking, the trunk is carried backwards—an advantage, however, dearly bought because of the swiftly induced fatigue of the *flexors* of the hip.

In the same fashion, in wasting and weakness of the *knee extensors*, the victim, with a constant eye to the action of gravity, adopts precautionary attitudes. Thus, if the knee is extended he can stand, for the constitution of this joint is such that while in this position he can for the nonce dispense with the extensor.

(3) *Volume and Electrical Reactions.*—As to the significance of *volume* we need not dilate thereon to any extent, as most of the observations previously made in regard to this factor will apply here also. But it would seem that in the muscles of the *lower* extremity a more constant correlation obtains between mere *volume* and *functional* importance. Thus witness the massive bulk of the psoas, the gluteus maximus, and the quadriceps, and how predominant their rôle ! On the contrary, how meagre the size of the sartorius, the tensor vaginæ femoris, the plantaris, and the crureus, and how insignificant their relative functional value. Nevertheless, we must not push the contention too far—the lumbricals, the interossei, the abductor, and flexor brevis minimi digiti—but little muscles all ; yet it is their concerted action that gives that last propulsive thrust to the body as the ball of the foot loses touch with the ground !

Albeit, it is when we turn to the *arm* that we see how fallacious is mere *bulk* as a criterion of *functional* status. Need we labour the point if we recall the important functions of *pronation* and *supination* achieved in the main by relatively small muscle groups, and what of those subserved by the *intrinsic muscles of the hand* ?

Lastly, as to the *electrical reactions*, we need not recapitulate the inferences to be drawn, as those have already been cited in regard to wasting of the muscles in the *upper* extremity, and the same, too, in regard to our reflections on the *duration* or *persistence* of muscular wasting.

*Assessment*

The difficulties of forming exact estimates as to the *functional* significance of muscular atrophy are as pronounced here as in the *upper* limb. For muscular wasting, as Imbert says, is not a disease, but a *complication*, and to view it as a detached entity is correspondingly difficult. But, again, it may be observed that the *functional* consequences of many lesions, notably those of articular nature, can only be gauged by the intensity of the associated atrophy that has ensued in related muscles. As Chavigny shrewdly observes of traumatic atrophy of reflex articular origin, " Si la lésion est articulaire, le pronostic est musculaire."

As to the proffered estimates, the French "Guide Barème" lays down the following assessments :

| | Per cent. |
|---|---|
| (*a*) Total atrophy of thigh muscles | 30 |
| (*b*) Atrophy of the anterior muscles of thigh | 20 |
| (*c*) Complete atrophy of the leg muscles | 30 |
| (*d*) Atrophy of the anterior muscles of the leg | 10 |
| (*e*) Complete atrophy of the muscles of the lower extremity | 60 |

Remy, the French expert, adduces the following figures :

| | Per cent. |
|---|---|
| (*a*) Complete atrophy of the thigh muscles | 33 |
| (*b*) Atrophy of anterior muscles of thigh | 10 |
| (*c*) Complete atrophy of leg muscles | 30 |
| (*d*) Atrophy of the anterior muscles of leg | 15 |

It is difficult in regard to Remy's estimates to realize why he should have assessed *total atrophy of the extensors* of the knee (10 per cent.) at less than the *antero-external* muscles of the leg (15 per cent.) We must agree with Imbert that these figures should be reversed, and we would add *increased*—so grave is the disability. It is ludicrous to suggest that the *resultant incapacity* in total loss of the power of extension of the knee can be evaluated at 10 per cent. For be it noted that in vocations necessitating the climbing of stairs or ladders a change of occupation may be imperative. This too, not only because of the disability, but also by reason of the correlated *liability to accidents.*

For ourselves we would, in complete atrophy of the *extensors of the knee,* rate the resultant incapacity at no less than 40 per cent., and of the *anterior muscles of the leg* at 20 per cent. Complete atrophy of *all* the *thigh muscles* should be rated at 50 per cent., and a similar wasting of *all* the *leg muscles* at 30 per cent., while total atrophy of *all the muscles* of the lower limb, a condition resulting in complete *functional* annihilation of the member—save by the wearing of a most cumbersome apparatus—should not, we think, be evaluated at less than 70 per cent.

## Rupture or Section of Muscles or Tendons

### *Upper Limb*

Rupture, whether total or partial, may follow sudden violent tension thrown on the fibro-muscular or tendinous structures, especially the latter. Such may occur in the *long head* of the *biceps,* and less frequently the *deltoid,* the *pectoralis major,* and certain muscles of the forearm.

In the *biceps,* and for that matter all other muscles subjected to rupture or section, the essential point from a *functional* aspect

is the *extent* of the lesion. Is it *complete* or *partial*? If the former, retraction of the two ends follows with the resultant total impotence of the muscle. Given such complete breach of continuity the *incapacity* is *enduring* unless *suture* is performed. If not undertaken, the *permanent* degree of disablement entailed is assessed by Imbert at 15 to 20 per cent. In the French "Guide Barème," irrespective of the *identity* of the muscle, rupture or section of the tendon thereof is invariably evaluated in the active at from 10 to 20, in the passive limb at 5 to 10 per cent. As a routine evaluation, such may in the aggregate prove a fair estimate in muscles of the upper limb.

*Incomplete* rupture postulates no such disability; the incapacity is *temporary* and very sensibly inferior in degree. Assessment should be *minimal* and subject to revision at the end of two months, when the weekly payments would usually call for withdrawal.

As to rupture of the *long head of the tendon* of the *biceps* Golebiewski attaches no great importance thereto. In one case only out of eight was flexion of the forearm, and especially supination, sensibly hindered. In all the other examples the functional disabilities at the end of three months were negligible. Also the author states he discovered the lesion, lying *latent* as it were, in workmen whom he examined for other affections. Imbert quotes an instance from Kaufmann in which incapacity to the extent of 12 per cent. was admitted for the space of five months.

### *Tendinous Lesions in Wrist or Hand*

*Extensor Tendons.*—Sudden forcible flexion, as Delbet, Segond, and other French observers have pointed out, may result in avulsion of the extensor tendons from their insertion on the *ungual* phalanges of the digits (excepting, of course, the thumb) with or without detachment of their insertion facets. Given immobilization of the phalanges in extension spontaneous reattachment may ensue, the more readily, according to Bonneau, when the bony facets are detached. As to the disability produced, active extension of the ungual phalanx is impossible, and the same drops forthwith into a position of *flexion*. In effect, therefore, the functional disability is a limitation in the range of movement of the *end joint*.

We have seen many instances of *war wounds* involving rupture of one or more of the extensor tendons at a higher level—the dorsum of the hand—and also embarrassment of their action by subjacent callus thrown out in the but too frequently associated fractures of the *metacarpus*.

As to the minimal lesion, *avulsion of these tendons* at their attachment to the end joint, these, according to the "Wiener Schema," do not merit compensation. French experts, notably Imbert, consider that the disability in rupture of the *index* tendon should be assessed at 3 to 4 per cent., and similar lesions in other digits at 1 to 2 per cent. In German and Austrian courts, rupture of the extensor tendon of the index is scarcely ever compensated. (*Vide* chapter on "Ankyloses of Upper Limb.")

The assessments of the French "Guide Barème" in section or rupture of the *extensor* tendons are as follows:

| Digit involved | Active limb | Passive limb |
|---|---|---|
| Thumb | 8% | 5% |
| Index | 5% | 4% |
| Middle | 3% | 2% |
| Other digits | 1 to 2% | 1% |

*Flexor Tendons.*—For flexion to be wholly abolished in the *finger* it is clear that both the *superficial* and *deep* flexors must be wholly ruptured or severed. The resultant disability is loss of all power of flexion in the implicated finger save the limited amount achievable by the *lumbricales* and *interossei*.

If, however, the flexor tendons be severed at the level of the *wrist joint* the resultant degree of disablement is profound, associated as it will be almost inevitably with lesions of the *median* and *ulnar* nerves.

The figures of evaluation for section or rupture of the flexor tendons as cited in the French "Guide Barème" are as follows:

| Digit involved | Active limb | Passive limb |
|---|---|---|
| Thumb | 10% | 8% |
| Index | 8% | 6% |
| Middle | 5% | 4% |
| Other digits | 4% | 3% |

As to the evaluation of the graver effects ensuing in section of the flexor tendons at the *level of the wrist*, these would merit much higher rates of assessment. Given no serious involvement of the nerves at the wrist the resultant incapacity would vary in degree according to the *number* of the tendons divided and the *identity* of the digits, the highest assessments being accorded to the *thumb* and *index*. The disablement incurred being very similar to that met with in ankylosis and partial limitation of movements of the digits the evaluations may be on a scale proportionate to those laid down in the tables of assessment for these disorders.

*Lower Limb*

Of the muscles of the lower limb those in the *thigh* are most liable to rupture or section. The *quadriceps extensor* is frequently torn in athletes or others. Fortunately the lesion is almost always *incomplete*, and total loss of the power of extending the knee does not ensue—the continuity being maintained through the medium of the fibro-aponeurotic structures. Still, as a sequel, *adhesions* may form between the ruptured aponeurosis and the patella or its ligament. In this event, though free extension of the knee is possible, *flexion* is limited, until the opposing bands have been broken down and the muscle thus released.

The *adductor muscles*, especially the long adductor, very commonly in horsemen sustain *partial* or *complete* rupture located at their pubic insertion or lower down in their bellies. Lastly, similar lesions in the *gastrocnemius* or plantaris are not uncommon. In the former the breach may be in the fibres, or in some instances the tendo Achillis is partially or completely torn.

The resultant disabilities in the foregoing lesions may be gathered from previous observations; and now as to their *assessment*. The recorded estimates chiefly emanate from Continental authorities. Imbert, in a very extensive rupture of the muscular mass of the *quadriceps extensor*, inferred a disability of 40 per cent. He quotes also certain assessments of Kaufmann and Golebiewski. The former, in a case of *incomplete* rupture of the quadriceps, gauged the incapacity at 25 per cent. The latter, it may be added, records two examples, in one of which, a *partial* rupture of the quadriceps, he assessed the incapacity at 20 per cent.; in the other, an instance of rupture of the *semitendinosus*, at 15 per cent.

In rupture of the *tendo Achillis*, given favourable cicatrization, the assessments of German Jurisprudence of the disability occasioned range from 8 to 10 per cent. Lastly, as to the rates of evaluation accorded these or similar lesions in the French "Guide Barème," they are as follows:

| | Per cent. |
|---|---|
| A. *Rupture of the Muscle Belly:* | |
| (*a*) Total section of the muscles on the anterior or posterior surface of the thigh . . . . . | 40 |
| (*b*) Partial section of the same . . . . . | 20 |
| B. *Rupture of Tendons:* | |
| (*a*) Rupture of *patellar tendon* so called, or of patellar ligament, being almost always incomplete, does not entail anything more than a slight disability, which may be evaluated at . . . | 10 |
| (*b*) Rupture of the *tendo Achillis*, repair of which after a variable period takes place completely, entails compensation rated at . | 10 |

### Ischæmic Myositis

While, strictly speaking, it is without our province to discuss the various theories advanced as to the ætiology of this affection, still some recent observations of Sir Purves Stewart call for consideration. This for the pertinent reason that the *functional end-results* vary somewhat with the ætiology of any given case, and in this way some measure of differential assessment is attainable.

According to the foregoing authority, in *peace* the commonest cause of ischæmic myositis is the too tight application of bandages or splints in fractures of the forearm or elbow—the so-called von Volkmann's paralysis. The affection is almost invariably located in the upper limb, and is of most frequent incidence in children or adolescents.

On the other hand, in *war* the most frequent cause is *occlusion of the main artery* of the limb by ligation. Its site is variable, although more common in upper extremity—following ligature of the subclavian, axillary, or brachial vessels, and in the lower limb of the femoral artery. Lastly, in the least common type the condition ensues through *spontaneous* obstruction of the main artery as the result of embolism or thrombosis.

As to the objective or *anatomical* changes met with in these various forms, it may be remarked that they differ *quantitatively* rather than qualitatively. In other words, in the first type—viz. that referable to constriction—the coagulation necrosis and subsequent sclerosis are *patchy*, whereas in the two latter varieties the morbid change is *diffuse*, involving the muscles in their entirety.

*Clinically* also the following distinctions may be drawn. In the former type the responses to faradism and galvanism are retained, while the existence of anæsthesia is rare. In the two latter varieties—viz. those due to artificial or spontaneous occlusion—the reactions to both forms of electrical current are nearly always lost, and anæsthesia of the periphery of the limb is the rule rather than the exception.

#### Factors in Evaluation

As to these it is generally held that the chief consideration is the degree to which the *functional* aptitudes of the hand are prejudiced. In other words, how many digits are put out of action or crippled? Also, is the *thumb* implicated or not? Our evaluation will, however, be more intelligent if we realize that it is the extent of the muscle *sclerosis*, the presence or absence of

*electrical responses*, and the existence or not of *anæsthesia* that are the deciding factors. Upon the findings in these respects depends the outlook as to the ultimate functional efficiency of the affected limb.

*Assessment*

As to the question of evaluation of these cases, we find that the guiding principles in the French "Guide Barème" are as follows: The authorities—after recalling that the thumb in the majority of examples is not involved—adopt as their basis of differentiation *the freedom or not of the thumb*.

In instances in which the *thumb is implicated*, they assess the resultant incapacity in the right at 60, in the left at 50 per cent., the hand being held to be, *functionally* speaking, *hors de combat*. In cases, however, in which the thumb is *not* involved, the disability occasioned is rated in the right at 40, in the left hand at 30 per cent.

Reverting to the opinion of individual experts one may remark that Binet rates the functional incapacity incurred (provided the thumb is unaffected) as not exceeding 30 per cent. This Imbert, and very rightly so, regards as quite inadequate, for, as he contends, the morbid process, if extensive, involves the functional loss of the four inner digits. Moreover, as he adds, if *all the five fingers are implicated* the hand may be regarded as useless. He therefore would in the latter event assess the incapacity in the right at 60, in the left at 48–50 per cent. Given *non-implication of the thumb* he, as a maximum, rates the disability in the right at 40, in the left at 30 per cent.

For ourselves we think that in these cases the figures of assessment should vary according to the ætiology, the electrical responses, and the extent of the morbid process. It is, for example, obvious that the prognosis in cases due to *artificial* or *spontaneous occlusion of the main artery* is inevitably much more gloomy than in cases due to tight bandaging. Accordingly—given such a mode of causation with total loss or diminution of electrical responses, and implication of all five fingers—we should for ourselves assess the incapacity in the right at from 60 to 70, and in the left from 50 to 60 per cent. The lower figures might be adopted in those instances in which the *thumb is not involved*, and the electrical reactions, though diminished, can still be elicited. The higher might be reserved for those in which the *thumb is involved* and the electrical excitability is wholly lost.

On the other hand, in cases due to *constriction* we must bear in mind Sir Robert Jones' dictum that "a properly conducted

mechanical campaign" may lead to great lessening, if not abolition, of the resultant incapacity in this affection. Thus the above authority, regarding his method of treatment by stretching, delivers himself as follows: "As a result the circulation of the fingers is rapidly restored, and quite soon fingers which were originally shrivelled like birds' feet, fill out and develop fatty pulp, scar tissue becomes pliable, and where the destruction of muscle has not become too extensive function returns."

Clearly, therefore, in cases of this nature assessment should be postponed until the measure of *residual incapacity*, if any, can be gauged. Our figures will call for grading in accordance with the degree to which the *functional* aptitudes of the hand are compromised. This, again, will depend largely on whether the thumb is or is not implicated. No average assessment is therefore possible. Each case must be judged individually, and as an aid to more accurate appraisement of the degree of functional depreciation occasioned, we would refer the reader to the Tables of Assessment in Ankylosis of the Digits—for here, as elsewhere in the upper limb, the ultimate criterion of functional efficiency is *mobility*.

### Dupuytren's Contracture

Leaving aside the vexed question of its ætiology, the salient feature of this disorder is a retraction of the last four digits, *progressive* and inveterate in character, which ultimately pins them down into the palm. It sets in insidiously, but its *functional* results are very similar to those entailed by the *articular limitations* which follow wounds, fractures, or inflammatory processes in this region.

The sole estimate of the incapacity entailed by this intractable affection we have encountered is the one forthcoming in the French "Guide Barème," in which, given retraction of the last four fingers, it is assessed in the right at 20, in the left hand at 10 per cent.

### Chronic Teno-Synovitis of the Wrist and Hand

With this as a sequel of Colles' fracture or infective processes in the palm we are all but too familiar. The functional consequences of chronic effusion into the sheaths of the tendons in this region, or of extensive adhesions between their opposed surfaces, are very grave. The related joints become stiff, no longer capable of mobilization by their governing tendons, though the contractility of the related governing muscles is unimpaired. Similar, too, are the consequences of synovitis of the *wrist* with

involvement of the contiguous tendons of the forearm muscles when fixation of the phalangeal joints and more or less *ankylosis* ensue.

As to the estimation of the degree of the *resultant incapacity*, this will vary according to what extent the condition has determined ankylosis or limitation of movement in the wrist and phalangeal joints. (*Vide* chapter on "Ankyloses.")

## CHAPTER XXIII

# LESIONS OF JOINTS, BONES, AND OTHER STRUCTURES IN THE LIMBS

### Dislocations

Luxations, if uncomplicated by *fracture* of the articular end or shaft of the related bone or by *nervous* or *vascular* lesions, do not as a rule portend prolonged disablement. Simple dislocations, e.g. of the *shoulder*, if immediately and successfully reduced, how different the outlook to those associated with fracture of the *surgical* neck, great tuberosity, or glenoid cavity—this obviously because of the superadded *intra-articular* lesion with its aftermath —delayed and often impaired functional restoration. Luxation of the *elbow*, again, is more serious than is generally realized, because in adults it often predicates impaired *functional* aptitudes, not only because of its frequent complication by fractures of the condyles or coronoid process, but also by reason of the fact that traumatic *myositis ossificans* is but too apt to develop in the related muscular structures.

Luxations of the *hip*, if we except the *central* and *anterior* varieties, do not, if successfully reduced, leave any degree of *permanent* incapacity. In the same way dislocations of the *knee*, despite their inevitable accompaniments—rupture of the *crucial* and other ligaments—do astonishingly well, recovering with little, if any, impairment of function. Again, in dislocations of the *ankle*, if uncomplicated by Pott's fracture, the outlook is good. But in the *backward* type, as Sir Robert Jones has pointed out, perfect functional restoration will not be achieved unless it is thoroughly reduced. For otherwise the range of *dorsiflexion* will be mechanically obstructed by the anterior edge of the tibia.

To sum up, the attention of the assessor will be more often centred upon dislocations of the *shoulder* or *elbow*, and less frequently on old unreduced luxations—this because of their greater liability to be followed by greater or lesser degrees of *disablement*.

First, as to the *shoulder*, we have to recollect that even uncomplicated forms are not infrequently followed by a *periarthritis*, the adhesions resulting therefrom occasioning painful and restricted mobility, and of course correspondingly prolonged

disability. Apart from this there is the further danger of *recurrence* from often trivial causes, indeed it may often transpire during sleep. *Recurrent* dislocation—but too easily brought about—is not always as easily reduced. Imbert also draws attention to the fact that the effect of such repeated luxations on the *morale* is most depressing, and in one case led to suicide. Capsulorraphy, too, may fail of its end. This observer cites an instance in which, five months after its performance, luxation again ensued, and this after a by no means strenuous effort. He is inclined, therefore, to regard recurrent dislocation of the shoulder as a very disabling disorder. When, therefore, the luxation has recurred three or four times through trivial causes he has not hesitated to evaluate the *resultant incapacity* in the *active* limb at 37, and in the *passive* limb at 32 per cent.

As to the question whether all the recurrences can be attributed to the *original* dislocation, we agree with him that the answer should be in the affirmative. He is rightly of the opinion, which few will traverse, that it is, as a rule, only the *circumstances of origin* of the *primary* dislocation that merit the term " accident." The recurrences either occur spontaneously or through such banal eventualities that one cannot resist the conclusion that they would not have transpired had not the way been paved by the original luxation. But, unfortunately, at the time of the receipt of a dislocation there is no possibility of determining whether or no it will become recurrent in character. The recurrence of a dislocation may be postponed for as long as three years !

As to the recorded estimates of incapacity, the French " Guide Barème " rates that occasioned by *recurrent dislocation* of the *shoulder* at 40 in the active limb, and 30 per cent. in the passive limb. This assessment would appear reasonable, and in cases complicated by *arthritis* the degree of the disablement will, of course, vary according to the measure to which the *movements* of the shoulder are compromised and the intensity of the muscular *wasting* that ensues. Still, in these cases, with time there always ensues a considerable amelioration of the disability, and we should therefore allow a sufficient period—eighteen months to two years—to elapse before attempting to gauge the true extent of the *residual* incapacity.

Similarly in dislocations of the *elbow* the *residual* degree of disablement will vary according to the extent to which the functional efficiency of the *joint* has been prejudiced (*vide* chapter on " Ankyloses "); this as the outcome of the tendency to the production of *traumatic myositis ossificans.*

The French " Guide Barème " in instances of luxation of *all* the *metacarpal* bones on the carpus, with overlapping, rates the

*resultant* incapacity in the active at 60, in the passive limb at 50 per cent. ; while in cases in which there is a similar lesion of the *two* last metacarpals the loss in industrial capacity is estimated at 40 and 30 per cent. respectively.

Lastly, in the case of *old unreduced dislocations*, the degree of disablement will depend on the extent to which the *mobility* of the affected joint is interfered with and the *intensity* of the muscular atrophy that ensues.

## Arthritis

Whether we be confronted with an *acute* or *chronic* inflammation of a joint, and whatever be the assigned ætiology of the affection, in either instance its interest for the assessor must always lie in its *functional* consequences.

For him the important points to ascertain are the existence or not of *ankylosis*, either total or partial—the presence or not of *atrophy* in the related muscles. As to the former, he must in regard to *total* ankylosis ascertain the *angle of fixation*. Or if it be only *partial* restriction of mobility that has resulted, what is the *arc of movement* retained. Is it *favourable* or *unfavourable* ? But for all information as to their functional significance and alike their evaluation, we would, to avoid repetition, refer the reader to the chapter on "Ankyloses," and that relating to "Muscular Disorders."

Here we would only insert some assessments cited in this sphere by the French "Guide Barème." In *chronic purulent arthritis* of a *large* joint—the same *not being judged incurable*—they assess the resultant incapacity, if the affected articulation be located in the active limb at 60, in the passive limb at 50 per cent.

## Hydrarthrosis

While, of course, any individual joint may become the seat of an excess of an *intra-articular fluid*, we may for all practical purposes regard the disorder as, if not peculiar to, at any rate of predominantly frequent incidence in the *knee* joint.

Thanks to the good offices of *skiagraphy*, and the increasing knowledge derived from naked-eye inspection during *exploratory operations*, we hear less and less of so-called "rheumatic" and "gouty" types of hydrarthrosis : more and more of *anatomical* lesions, the true source in most instances of this disorder. These "internal derangements," located in the cartilage, synovial fringes, crucial ligaments, bony processes, or fatty pads, are for the most part, if not entirely, the outcome of *trauma*, direct or

indirect in character. Only in *bilateral* varieties therefore shall we be justified in referring them to some *constitutional* or *infective* element.

While it is essential that the assessor be familiar with all these ætiological factors and their clinical differentiation, it is pre-eminently imperative that he be fully cognizant of the *functional* disabilities that may follow a condition of hydrarthrosis in the *knee*, whatever its mode of origin. It is, moreover, highly necessary that he be aware of the resources of surgery in this connexion, and so be in a position to state whether or not there be indications for *operative* intervention, which if successful may haply cure, or at any rate diminish the degree of residual disability.

## Factors in Evaluation

But coming down to the actual point at issue, what are the factors on which to base the *measure of the incapacity* entailed through hydrarthrosis? Certainly the *amount* of the *effusion* cannot in itself be regarded as an element of evaluation. It is, however, indirectly a guide thereto. Its presence, to begin with, predicates *continuance* of the morbid process, and more important, generally speaking, the more massive the effusion the more intense the *atrophy of the related muscles*—the *extensors* of the knee. It is this—the *degree of the muscular atrophy*—that constitutes the salient factor in evaluation of the resultant incapacity. This wasting of the extensors, more particularly the *vastus internus*, is often astonishingly rapid in its development.

The same spells *instability* of the knee joint—instability moreover, be it noted, accentuated by the often co-existing and causally related *relaxation* of the *ligamentary* structures thereof. The effusion waxing and waning from time to time is reflected in periods of more or less *absolute* incapacity alternating with periods of *lesser* or, it may be, *inappreciable disablement*. Always, however, this insecurity of tenure of working powers, these breaches in the time-table, these lapses in earning capacity! We allude here to inoperable cases, or those in which, despite operation, the condition persists in its *recurrence*.

In light of its chequered life-history it may therefore be conceded that a hydrarthrosis, when persistent, entails a marked degree of permanent incapacity. It is, of course, the liability to relapses that occasions the difficulty in assessing these cases. Accordingly, all the greater urgency for their sound and radical treatment at onset, and the more imperative too, that the initial effusion, failing operation, be accorded adequate time for rest and reabsorption. Viewed at their onset, no rash assertions as to

*permanency* should be indulged in. This certainly not pending the lapse of two months or more.

Now, as to the *relapses*, it seems neither in the *financial* nor *moral* interest of the victim to implant in his mind the conviction that he is *permanently* incapacitated. *Potentially* speaking he may be, but not *actually* so. His periods of disablement from time to time cease, and his working powers are regained. To assess him as *permanently* disabled is therefore, strictly speaking, inaccurate. Such a man may be in constant work for ten or more months in the year, and then through some unlooked-for mishap, often trivial, *effusion* appears. Is it not, therefore, more rational, more just to *employer* as well as victim to disregard the potentialities and fix our attention on the *actualities* of the case? Let us concede *total* incapacity while the hydrarthrosis *persists*, but admit *cure* when the same has passed away. This at any rate unless there be a marked degree of *muscular atrophy*, for the same when present does constitute a *lowered* capacity for work.

*Assessment*

According to Müller *permanent* incapacity is not rare. Thus in twenty-seven cases observed by him he found at the end of two and a half years that they had incurred an average incapacity rated by him at 13 per cent. German legislation allows a *permanent* annuity running up to 15 per cent. Duchaffour, the French authority, has admitted incapacities ranging from 0 to 9 per cent. In several cases as recorded in "Le Jurisclasseur" the degrees thereof range from 0 to 23 per cent. Again, Imbert, in cases of *persistent effusion* with *muscular atrophy*, has in several instances inferred a *minimum* incapacity of 10 per cent., which in serious cases was elevated by him to 20 per cent. Finally, the French "Guide Barème," in instances in which the condition has become chronic and associated with muscular wasting and laxity of the articular surfaces, rated the residual disability at 10 to 20 per cent.

## Chronic Osteomyelitis

This affection, with which unfortunately the circumstances of war have made us familiar, demands at any rate a brief allusion. Both *directly* and *indirectly* it does, of course, prejudice the *functional* capacity of the affected limb. It is, for example, a frequent occasion of *reamputation*, sometimes oft repeated. This shortening of the member, though unavoidable, may involve greater difficulty in fitting an artificial limb thereto.

Moreover, *stumps*, the seat of *osteomyelitis*, develop physical

characters which at best prejudice and may negative the wearing of the same. Thus, certainly if there be bony suppuration, its use becomes impossible. Also, even when pus formation has ceased, the same is denied as long as the stump is *œdematous* and *painful* to pressure. For the irritation involved is almost certain to excite new abscesses with fresh *sinuses*. Nor can we overlook the fact that the presence of an osteomyelitic process in a stump favours its assuming an undesirable *conical* shape. Obviously all these factors prejudice the advantages that would otherwise be gained if the stump were one favourable for the fixation of an artificial limb.

Leaving this aside we have to recollect the intensity of the *muscular atrophy* produced. This notably in fractures the seat of osteomyelitis. To this must be added the grave *shortening* that but too often ensues from actual loss of substance: also, especially in the lower end of the *femur*, the mobility of the knee may be restricted through the mechanical obstacle formed by the massive thickening of the articular end.

As to the estimation of the resultant incapacity entailed through osteomyelitis, we would, in regard to its prejudicial influence on prosthesis, refer the reader to the chapter on "Amputations." The chapters on "Fractures" will be found useful in grading the effect on *functional* capacity of various degrees of *shortening*, while for the restriction of *articular mobility*, we would refer the reader to that on "Ankyloses."

Here we would merely insert the fact that the French "Guide Barème" in cases of *persistent fistula*, the outcome of bony necrosis of traumatic origin, assesses the *partial* and *temporary* incapacity that results at from 10 to 20 per cent.

### Subcalcaneal Exostoses

While pain in the *heel* affords many loopholes for misinterpretation, it may be of the nature of *referred* pain associated with *renal calculus*, *hæmorrhoids*, or *enlarged prostate*. Here, however, we are concerned only with *local* causes, and it is well to recollect that it may in young subjects be due to *gonococcal* inflammation of the *plantar fascia*, to inflammation of the *bursa* under the os calcis, or a symptom of flat-foot referable to excessive strain on the posterior insertion of the plantar fascia. Lastly, owing to the revelations of *skiagraphy*, we now know that it is frequently due to a bony *spur* on the inferior surface of the os calcis. Still such bony spurs may be detected by accident, thus showing that they are not necessarily *painful*. They have been found in both heels, and yet only *one* was complained of.

*Assessment*

For the assessor, the intricate point to be solved is whether the affection is to rank as a *disease* or an *accident*. Reclus on this point favours the latter assumption, which in cases originating from a more or less severe injury would be a legitimate presumption. Inasmuch, however, as the bony spur is easily removable, and that without danger, *permanent* disability should not be often, if ever conceded. *Ceteris paribus*, refusal of such an operation should, we consider, be deemed *unreasonable*. Reclus, in the case above recorded, estimated the resultant *professional* loss at 15–20 per cent. A man would, we think, however, have a definite claim for *compensation* if—having submitted to operation—the resulting *scar* through *avoidable* and *ill-advised location* subsequently occasioned *incapacity* through its *sensitiveness* when subjected to pressure as in standing or walking.

Needless to say, too, when the subcalcaneal exostoses or bony irregularities are the residuum of *osteitis* or *periostitis*, secondary to a fall or *gunshot injury*, some degree of incapacity must be allowed. Here again it must be recollected that the bony masses can be removed, but treatment according to Sir Robert Jones is often unsatisfactory. Having regard to the fact that short of cure, palliative measures are possible, the incapacity should not be assessed above 20 per cent.

In the French "Guide Barème" subcalcaneal exostoses are cited as a frequent sequel of *fractures of the calcaneum*, and the resultant incapacity is rated at from 15 to 20 per cent.

## Traumatic Myositis Ossificans

This deplorable affection, the pathology of which is so obscure, develops in the substance of *muscular* masses more commonly near their *insertions*. It may follow *trauma*, sudden and violent, such as a *dislocation*, or injuries involving damage to the periosteum. Such osteomata may develop in the *adductor* muscles in sequence to "rider's sprain."

In the *upper* limb, the sites of predilection for these bony formations are the insertion of the *brachialis anticus*, the substance of the *biceps*, and the lower part of *triceps*.

From the point of view of the assessor their importance lies in the *functional incapacity* they produce when developed in contiguity to an *articulation*. They then may restrict to a varying degree its range of movement, and accordingly they must be assessed on the basis of the spurious *ankylosis* that ensues. (*Vide* chapter on "Ankyloses.")

## Malignant Growths

These may develop in any of the structures of the limb, as the result of *long-continued irritation*, or in sequence to some definite *trauma*. Inasmuch as we have in our chapter entitled "The Origin of the Disability" devoted considerable attention to the relationship of trauma to growths subsequently developed at the site thereof, we shall here content ourselves with the postulates that are laid down by Segond in the French "Guide Barème" as justifying the assumption that a given malignant growth is of *traumatic* origin. He submits that the following conditions must be fulfilled :

(1) Authenticity and adequate severity of the alleged trauma.

(2) Established integrity of the injured region *before* receipt thereof.

(3) A reasonable period of delay between the receipt of trauma and the date of appearance of the neoplasm—viz. a delay not exceeding two to three years.

(4) The existence of pathological manifestations at the *site* of injury, the same continuing throughout the period elapsing between the accident and the appearance of the growth.

(5) Microscopic verification of the nature of the neoplasm.

### *Assessment*

These proofs adduced, how shall one evaluate the incapacity ? Two contingencies, says Segond, may arise : (*a*) The malignant growth is inoperable ; death ensues after a longer or shorter period ; this involves a pension to the widow ; (*b*) the malignant growth is operated on, but recurrence is to be expected. The indemnification should then be in accordance with the diminution in working capacity that follows in the wake of operative intervention (disability entailed in overcoming the resistance offered by the cicatrix) and the degree, more or less pronounced, of the cachexia.

## Flat-foot

*Flexible* and *rigid* varieties of this painful affection are not perhaps as easy to differentiate as some imagine. From the aspect of pensions or compensation the important point to grasp is that the condition may be due to *long-continued strain* or *sudden trauma*, both exerting their effects through gradual or sudden stretching of the ligaments or tendons responsible for the maintenance of the plantar arch. But to avoid being imposed upon, the assessor should recollect that a similar condition may arise in *gonorrhœal periarthritis*.

Now as to the responsibility of the employer or State for the lowered working capacity that may ensue. It cannot, we think, be legitimately held that a spontaneous flat-foot arising through *overwork* can be regarded as an "accident." It is in truth but a concomitant of *over-fatigue*. On the other hand, it is certain that given a flat-foot developing in sequence to a *fracture*, especially if multiple, of the *astragalus* or *calcaneum*, the soldier and alike the industrial worker have established their claim to pension or compensation. For the trauma has mechanically transformed a normal into an *abnormal* foot—in short, into a *traumatic flat-foot*. It should be recollected, too, that flat-foot may arise in Pott's fracture through undue strain thrown on the immature callus by the body-weight as a consequence of too early resort to walking. On the other hand, fracture is not a necessary prerequisite, for violent injury of the *soft* parts may suffice to cause flattening of the arch. It may follow fractures of the leg at sites *remote* from the foot. Here it may be referred, as Imbert remarks, to the *muscular wasting from disuse*, that common accompaniment of fracture. But the responsibility of State and employer is equally concerned, the flat-foot being the outcome of the treatment necessary for the *primary* injury.

### Factors in Evaluation

The salient factor in the evaluation of the incapacity following flat-foot is *pain*. This because no constant correlation exists between the degree of flat-foot and its painfulness. How many people does one see with very marked grades thereof, who can stand hard work and make no complaint? As Sir Robert Jones remarks, and we can confirm it out of our own experience, "Wounded soldiers may constantly be met with whose feet are very flat, whose *mid-tarsal* joints are fixed, but who have undergone several months of hard training without complaint." In truth, a flat-foot, the bones of which have become adapted—moulded to their new position—is usually *strong* and *painless*, and no better instance of *functional adaptation* could be adduced. But the *rigidity* of the flat-foot may be due to *adhesions* and *retractions of the ligaments*, and in such *pain* may result through strain of these structures. Or finally, a flat-foot may be the consequence of *spasmodic contraction of the peronei*, in which variety pain is a prominent symptom.

#### *Assessment*

As to the *evaluation* of the incapacity occasioned, the estimates are very meagre and divergent. They group themselves, according to Imbert, around two varieties of the affection.

(*a*) *Functional Flat-foot without accompanying Fracture of the Bones of the Foot.*—Kaufmann quotes an instance in which the deformity developed after *contusion* of the foot, and, *mirabile dictu*, the *permanent* incapacity was assessed at 40 per cent. : at the other extreme Bohm narrates an instance of the same in which complete restitution without incapacity resulted.

(*b*) *Traumatic Flat-foot with Fracture of the Bones of the Foot.*—All will agree with Imbert that this certainly calls for a pension or compensation, as usually the impairment of *working capacity* is pronounced. German legislation admits a degree of disablement which may range from 25 to 33 per cent.

Duchaffour has granted 10 and 12 per cent., but in a case of fracture of the os calcis with lowering of the plantar arch he elevated it to 50 per cent. Without further ado, we would refer the reader to our chapter on "Fractures of the Tarsal Bones" for assistance in the evaluation of these cases, and alike for the periods required for their consolidation.

In conclusion, as to other deformities such as traumatic *club-foot*, the evaluation of the same must depend on data forthcoming elsewhere in the chapter on "Fractures of the Leg and Foot." As to traumatic *coxa vara*, this also has been treated of in "Fractures of the Hip," and we may mention here that Remy rates the resultant incapacity at from 30 to 75 per cent. As to the traumatic varieties of *genu varum* and *genu recurvatum*, inasmuch as these are the outcome of vicious *callus* or vicious *ankylosis* we would refer the reader to chapters dealing with these morbid conditions.

## Varicose Veins

These are of interest both from the point of view of military pensions as well as compensation. It is conceded that in the majority of instances they are of *constitutional* origin. But Continental authorities, notably the French, admit their liability to aggravation by military hardships and fatigues as evidenced by the development of *ulcers*, *trophic troubles*, and *permanent œdema*.

Turning to the *industrial* sphere, Offergeld out of 1000 workers found 17·5 per cent. were the subject of varicose veins. They occur more commonly in the working classes, and the most pronounced forms are usually met with in those whose occupations necessitate prolonged standing or constant walking.

Alike in the matter of military pensions or compensation the important point to ascertain is in what way *strain* or *effort* can lead to their *aggravation*. It may be admitted that strain or effort may reveal the existence of *deep* varicose veins unknown

to the subject, and the aggravation of which is evidenced by the appearance of superficial varices or by the increased size of superficial veins already manifest. Again, a contusion may determine the formation of a *varicose ulcer* through rupture of a vein or incidence of the blow on skin the seat of varicose *eczema*. Lastly, *direct* trauma or effort may determine the onset of *phlebitis* in veins previously free from such inflammatory process, or in the subject of a latent phlebitis the same may determine the occurrence of *embolism*.

To establish the " conditions of claim " for pension or compensation it is necessary to link up these various contingencies with the trauma. It may be nothing more than a *coincidence*, the trauma having directed the patient's attention to *pre-existing* though previously unrecognized veins. It is for the expert then to decide if it is a coincidence or if the accident has clearly aggravated the lesion. If so, what is the reduction of *working capacity* entailed by such ?

Inasmuch as in the matter of pension or compensation it is necessary to establish a relationship between the alleged cause and effect, the following points may be of service : We must recollect, first, that ulcers may be *artificially* provoked, and such have been produced during the present war. More often an ulcer produced by accident is kept open or prevented from healing with the object of procuring discharge from service, or in an industrial worker to prolong the period of compensation for the initial injury.

The difficulty in varicose veins is that their presence predisposes to ulcer formation following *trivial* injury, and moreover the resultant scars break down readily. Apart from this, as we have remarked elsewhere, following healing of an ulcer produced by an " accident," the subject may aver that *prior* to the injury he had not suffered from *varicose veins*, and that these as well as the *ulcer* are the result of " accident." If not seen till the ulcer has healed, or nearly so, and the claim is only then lodged, what are the points on which we should rely in deciding whether the trauma stands in ætiological relationship ?

If the varices are *widespread*, this renders it doubtful if *trauma* is the cause.

If the varices are *slight*, with no scars of previous ulcers, and the proof of " accident " circumstantial, then the injury should be held responsible.

### *Assessment*

Now as to the *resultant incapacity*, this according to Forgue and Jeanbrau may be rated at 15, 20, or even 30 per cent. This

would appear to be a reasonable assessment when the varicose veins are held to be the outcome of some unusual exertion.

Again, if in the presence of *pre-existing* varicose veins an *ulcer* has resulted through a bruise or contusion, we must in our assessment take cognizance of the following points: Is the ulcer *inveterate*, showing a tendency despite all methods of treatment to *recurrence*? If so, we should not be far wrong in assessing it on an average at 20 to 30 per cent. Imbert rates such cases at from 15 to 25 per cent., adding this caveat, that *size* is in no way characteristic of a *traumatic* origin, the largest ulcers with badly nourished circumferential skin being precisely those in which injury is not a prominent ætiological factor. We have, too, to recollect that an old ulcer may ultimately lead to *necrosis* of the *tibia*, and in some instances to *cancer*, necessitating *amputation* of the leg, but such instances are fortunately exceptional.

Now, as to *phlebitis* and *embolism*, the former of which, though often spontaneous, can readily be provoked by a *wound* or *slight bruise*. Fortunately phlebitis is usually of *rapid* evolution, and cause and effect can therefore be more readily established. Finally, phlebitis itself may be complicated by *embolism*, which according to its site may determine long illness or death, and in either instance the responsibility of the State or employer is total.

## Venous Thrombosis of Upper Limb

The French "Guide Barème" in cases of *phlebitis* and *thrombosis* in the *lower* limbs affords the following estimates of the resulting incapacity:

| | Per cent. |
|---|---|
| (*a*) With slight œdema provoked by fatigue . . . . | 5 to 20 |
| (*b*) With pronounced œdema rendering standing painful . . | 20 to 30 |
| (*c*) Double phlebitis in which the standing position is so much more painful . . . . . | 50 to 70 |

We have here to recognize that *venous thrombosis* may result through strain, several instances having been recorded. In all cases the venous thrombosis was situate in the *upper* limb. In six out of seven cases recorded by Lenormant in *Presse méd.* for 1912, the trouble was in the *right* arm. Re-establishment of the circulation by collateral veins takes three, four, eight months, or more. The functional troubles are profound weakness, wasting, articular stiffness, pain, swelling, and cyanosis on effort.

If cure does not supervene in some months, impotence of the upper limb must be regarded as equivalent to paralysis. But fortunately recovery is the rule.

## CHAPTER XXIV

## AMPUTATIONS

"Loss of one or more limbs"—bald yet ominous phrase—sad indeed its significance to victim, and alike his kith and kin. Like trees reft of their branches by pitiless storm, or statues defaced by no less ruthless hands, these maimed heroes. Hideous these mutilations—the very crudities of war's insensate brutality. Urgent their dumb appeal, quicker than all else to evoke responsive chords of sympathy. This ever from time immemorial, as witness how men—urged by the piteous pass of such soldier martyrs, outraged by their sense of the incomplete—have striven to replace the lost limb by artificial substitutes. How pathetic must have been the reflections aroused by the artificial limb unearthed at Pompeii—a silent yet eloquent token of solicitude. Uncouth, maybe, the appliance, but still it voiced the wish to make good haply some Roman soldier's loss, his sacrifice on behalf of that bygone empire. Whatever the defects of this attempted replica of Nature's handiwork, immune shall it be from contemptuous sneer, when we of the twentieth century await still the fashioning of a perfect artificial limb.

### General Considerations

The toll of amputations exacted in the current as opposed to all previous wars is appalling. How much so may be gleaned from the following pregnant facts: Thus the records of St. Thomas's Hospital, according to Edred M. Corner, reveal that out of 5843 major operations performed in 1913, only 34 were amputations, less than 1 per cent. Yet compare these figures with those adduced out of the experience, not of a collective hospital staff, but of individual surgeons since the onset of the present war. Muirhead Little assures us that he is within the mark when he affirms that 5000 amputations have passed through his hands at Roehampton. Again, Huggins, discussing the surgery of amputation stumps, bases his conclusions on inferences drawn from no less than 2000 consecutive cases.

Clearly, then, amputations are of incomparably more frequent incidence in war than in times of peace. Apart from the fact

that under the former circumstances limbs are necessarily exposed to the chances of direct avulsion we have to recollect, too, that the consequences of identical lesions are infinitely more dire. Injured limbs, which in *civil life* might be treated conservatively, and the menaced member saved, are in *war wounds* but too frequently and inevitably sacrificed.

Divers malign factors, largely unknown in civil life, intrude and compel amputation—nay, re-amputation, and this forsooth oft repeated. Not to be marvelled at this when we recall the horrible *milieu* of war! Immediate aid is but too oft denied, and ever o'er the hapless victim broods the omnipresent *infection*, borne maybe by the projectile itself, or lurking in indriven debris. The severity, too, of the lesions—shattered bones, ruptured vessels, mangled nerves, rifled joint cavities, and oft-recurring hæmorrhages—how inevitably they spell loss of the limb! But it is here without our province to dilate on the manifold character of the different lesions that may render amputation imperative. For we are concerned rather with the utilitarian aspect of the problem, the functional consequences of such mutilations, their influence on *industrial capacity*.

## Specific Functions of the Limbs

Judged æsthetically, loss of a limb or part of a limb is revolting; it violates our sense of the fitness of things. But while tempted to dwell thereon, to bemoan the flaw in anatomical integrity, the breach in continuity, the broken contour, such would serve no useful purpose. It will be more helpful if we turn forthwith and contemplate the *functional* consequences of such lesions, and the measure to which they may be mitigated.

The specific rôle of the upper limb—the arm—is *mobility*, untrammelled—alike forceful and delicate, sweeping and precise—which reaches its acme in the highly specialized aptitudes of the hand. Contrasted with this most sensitive instrument, how relatively crude the functions of the lower limb—its chief office to uphold the weight of the body whether at rest or in motion. Succinctly expressed, *mobility* is the symbol of the upper, *solidarity* of the lower limb.

This disparity of function in the extremities is brought home to us but too painfully when we essay their artificial substitution. Ingenious maybe, yet how necessarily clumsy are all attempted replicas of the *arm*. Relatively abortive our efforts to compass mechanically its varied gifts of prehension, traction, etc., for ever and always are lacking the exquisite sensitiveness, the perceptive

and selective aptitudes—so distinctive features of Nature's handiwork!

How infinitely easier to achieve is *solidarity* than *mobility*, and in keeping with this, as Muirhead Little points out, "The artificial leg can be made to do nearly everything that is required of its predecessor—to do it, that is to say, more or less well, but not so well as the latter."

## Relative Functional Value of the Limbs

From a functional point of view loss of the *lower* is generally apprehended as being less serious than that of the *upper* extremity. This not only because in the former serviceable artificial substitutes are more easily attainable, but also by reason of the fact that for their pursuit most vocations do not demand continuous standing, much less constant progression, either walking, running, or mounting stairs.

The question that next arises is: Are the two limbs of *equal* functional value? The answer as regards the *lower* extremities is in the affirmative, for obviously both are equally necessary for the support of the body weight.

The two arms, it need hardly be emphasized, are not of equivalent functional importance. Ordinarily speaking the *right* hand is more constantly in action, more vigorous, and at the same time more precise in its movements. The same is reflected in all rates of evaluation.

Thus in our own Schedule of Specific Injuries, the degree of disablement occasioned by loss of the *right* arm at the shoulder joint is estimated at 90, of the *left* at 80 per cent. It is moreover stated that "in the case of *left*-handed men (certified to be such) the compensation in respect of the left arm, hand, etc., will be the same as for the right arm, hand, etc." "Certified as such" is the demand made by the pension authorities. But for ourselves, in regard of such affirmations by clergymen or other authorized persons, we often feel exercised as to whether the difficulty of establishing if a man is *right*- or *left*-handed is adequately realized. Prima facie the differentiation appears easy, but judged more narrowly it is not always obvious which is the *active* limb—the one most useful or upon which most dependence is placed in prosecuting the daily toil. Are there not many men, for example, who, nominally styled *right-handed*, yet affirm that in work their *left* is more useful than their right arm?

This, too, with some show of reason. Thus to hoist a shovelful of earth both arms must be enlisted: moreover, the strength of *both* appears to be equally engaged in the effort. At any rate it

can but very ineffectually be performed if one limb be out of action. Again, some men nominally *right*-handed have acquired the habit of using their *left* hand in the performance of certain tasks. Speaking, then, purely from the point of view of the *relative functional value* of either arm in the *actual performance of work*, it is not always easy to arrive at an exact decision. A man may, in all his social activities, be *right*-handed, but in his working hours his *left* hand may come to the fore as the more efficient of the twain.

This difficulty in limbs the seat of residual disabilities after fractures and so forth might be surmounted by asking the man to write his name, but when the arm is *lost*, what then? We have arrived at an impasse, and must perforce rely on the affirmations of responsible persons with previous knowledge of his habitudes of action, as displayed in and out of working hours.

### Differential Evaluation of Upper Limbs

Generally speaking, both in military pensions and the compensation awards of civil tribunals, this disparity in functional value of the upper limbs is reflected in the evaluations accorded the right and left arm respectively.

In the Royal Warrant of 1917 the degree of disablement occasioned through loss of the *right* arm was rated at 80, in the *left* at 70 per cent. These same in the Royal Warrant of 1918 were raised to 90 and 80 per cent. respectively. Now, the difference of 10 per cent. does not, to our mind, adequately represent, as a rule, the difference in functional value of the *right* as opposed to the left arm. We speak, of course, of *right-handed* persons. Any one reflecting on the usefulness of his right arm, its constant enlistment by preference in all actions whether requiring strength or skill, must perforce be convinced of the justice of our contention. Let him voluntarily place his right arm out of action for the time being, and depend solely on his left for all offices. Then let him reverse the procedure—release his right and bind up his left arm. He would, we think, be inclined to rate the degree of his disablement in the first instance as being very much more pronounced than in the latter—considerably more than is represented by 10 per cent. Therefore, while cordially endorsing the elevation (Royal Warrant, 1918) of the functional value of the *right* arm to 90 from 80 per cent. (Royal Warrant, 1917), we consider that instead of simultaneously raising that of the left to 80 per cent., this latter might with greater fairness have remained at the level assigned it in the Warrant of 1917—viz. 70 per cent.

The vagaries, however, of assessments, whether military or civil, in this respect wellnigh pass all understanding. For when we turn to the French "Guide Barème," we find that the reverse holds good—viz. that indifferently whether it be the *right* or *left* arm that is lacking, the resultant disability is held *identical*, and in both alike is rated at 80 per cent. It is difficult exactly to appreciate why this equivalence should be predicated. For, even granting that the evaluation of military pensions is purely *physiological*, not professional, we find it nevertheless difficult to concede that both arms, *in a functional sense*, are of *equal* value.

## The Evaluation of Mutilations or Amputations in "Accidents of War"

In the grading of *military pensions* our appraisement of the measure of disability ensuing after war injuries must, as we know, rest on a *physiological* as opposed to a professional basis. Still, whatever the process of reasoning adopted by the authorities, the fact remains that the evaluations of the varying degrees of disablement through different mutilations are *fixed*, and, pending the drafting of a fresh Warrant, *unalterable*.

Now, does analysis of the Schedule of Specific Injuries reveal any indication of the criteria whereby these arbitrary assessments were arrived at? Leaving aside all speculative hypotheses as to what may or may not have influenced the authorities, and adhering strictly to the Schedule, as rendered, the sole basis of the differential evaluations appears to be *the level of the amputation, the extent of the mutilation* (with the differential assessments of right and left arm we have already dealt). In other words, such eclecticism as is displayed is quantitative, not qualitative, in nature. That this should be so is, to our mind, much to be deprecated, and for the following among other reasons. It is, in the first place, misleading and, strictly speaking, inaccurate. It conveys the erroneous impression that a constant relationship obtains between the *measure of the anatomical loss* and the *resultant degree of disablement* incurred. It is not so—no such correlation of the twain exists or can be established. If this contention be correct, as we hope to demonstrate, it follows that evaluation by a sliding (anatomical) scale—*the higher the level of the amputation the greater the degree of the disablement*, and vice versa—is fallacious. In short, as in so many other items of the Schedule, the intent of the authorities that the amount of the pension shall be in "proportion to the degree of disablement" is again thwarted.

*The Extent of the Mutilation or the Level of the Amputation a Fallacious Criterion of the Resultant Degree of Disablement*

But brief reflection suffices to make clear that a scientific evaluation of the degree of disablement occasioned by a mutilation or amputation cannot be achieved solely on the basis of the extent or level of the same. This stricture is especially true when dealing with such, when occurring in the *upper* extremity.

For—indifferently of the nature of the lesion, whether a mutilation, an amputation, or what not—the measure of the ensuing disablement, in all eventualities, depends on *the degree to which the functions of its terminal appendage*—the hand—are compromised.

Now in integral lesions of the *hand* itself—loss of thumb, fingers, or a portion thereof—its utility is prejudiced in varying degree. How variable may be gathered from the appended figures of the French "Guide Barème"—though appreciation of this same is very largely discounted in our own Schedule of Injuries. But leaving aside *partial* lesions of the hand, we may with justice assume that it is the *total* loss thereof that constitutes the outstanding source of the disablement in avulsions or amputations involving deprivation of the same.

This being so, is it not obviously irrational to assess at *varying rates* the extent of the disablement entailed through amputations at different levels *above the wrist joint*? *Whatever the level*, the victim's hand, in any case, is *lost*, and therewith for all practical purposes the *functional capacities of the limb*.

Now our French confrères, in keeping with their more logical trend, have not, like our own authorities, lost sight of this essential element in their evaluation of the disabilities incurred through mutilations or amputations in the *upper* limb. Thus in their "Guide Barème des Invalidités" the degree of disablement occasioned by *loss of the hand* is assessed at 70 per cent. Consistently, therefore, with the process of reasoning above outlined they evaluate at the same figure the resultant disability in all other amputations of the upper extremity—*irrespective of their levels*. This, with one exception—viz. the resultant incapacity in *disarticulation of the shoulder*—is rated at 80 per cent. in both right and left arms.

As opposed to this, in our own Schedule of Specific Injuries, how various the assessments of the degrees of disablement in amputations at *different levels* above the wrist joint. Thus in the *right* arm if at the shoulder joint, 90; if above or through the elbow, 70; and if below the elbow, 60 per cent.—such are the figures allotted. In the *left* at the shoulder, 80; above or through

elbow, 60; and below the elbow, 50 per cent. Perhaps this is not to be marvelled at when we note, *mirabile dictu*, the glaring omission—*no evaluation of loss of the hand, per se*, whether right or left! Verily our Schedule of Specific Injuries calls for revision, and that right speedily!

It would be interesting to elicit the reasons that actuated the authorities in arriving at their differential evaluations of the degrees of disablement incurred by amputations at different levels.

But we would venture to suggest the propriety of the following innovations in coming Warrants. First, an attempt should be made to evaluate *loss of the hand, per se*, say 70 per cent. for the right hand.

This being granted, the evaluation for amputations at higher levels should be fixed at the same figure, 70 per cent., whether below, above, or through the elbow, or in the upper arm. This with the exception that 90 per cent. be the assessment if the arm be lost at shoulder joint (disarticulation). Similarly, let 50 per cent. represent the degree of disablement in loss of the left hand; and the evaluations of amputations at other levels stand at the same figure, raising the same in cases of disarticulation at the shoulder to 70 per cent.

Turning now from the *functional* to the purely *anatomical* aspect of this question, we find that the *level* of the amputation is not invariably a reliable index as to the *adaptability of the stump qua* an artificial limb. Put otherwise, it does not always follow that the *higher the level* of the amputation the *less suitable the stump for fixation thereto of an apparatus*, or the reverse. On the contrary, when we turn to the Schedule it would seem otherwise. Thus, amputations *above* or *through* the elbow (right) are assessed at 70, those *below* at 60 per cent. Now—*qua* an artificial limb—if the section is performed just *above the condyles* the resultant stump is more adaptable than if it took place either *through the elbow or at a point less than two inches from tip of olecranon*. Thus the stump resulting from a *disarticulation*, and this especially in the elbow, presents the following disadvantages. The massive size of the articular end gives a bulbous stump which, as the muscles atrophy, becomes more pronounced. Now the same being of larger girth at its lower end than higher up, it becomes impossible to procure a closely fitting bucket—the most suitable form of support.

Again, as Muirhead Little points out, "The artificial joint must either be fitted below its proper level, or else it must be placed on the sides of the bone end, and the limb must be still wider than its fellow, and consequently unsightly." Moreover, as

this observer adds, "To cover the articular enlargement, extensive flaps are needed, and these must sometimes be of thin skin. Such flaps are often deficient in vitality and likely to slough."

Accordingly, therefore, having, as we must, an eye to the ultimate fitting of an artificial limb, *disarticulations*, save in the case of the shoulder or hip, have fallen into disfavour, it being conceded that section through the limb *above* the related joint is the preferable procedure.

Turning to the *lower* limb, similar illustrations may be adduced. Thus both Pirogoff's and Chopart's amputations are performed at lower levels than Syme's variety, yet none will deny that the sound weight-bearing stump born of the latter presents compensations far outweighing the additional anatomical loss sustained in the length of the limb, as compared with that incidental to the aforesaid operations.

There are, however, exceptions—thus, in amputations executed near the *upper* extremity of the *humerus* or *femur*, the *lower the level* of division of the shafts the greater the advantages ensured for the artificial limb. Still, despite these reservations, we have cited sufficient examples justifying our contention that the *extent* of a mutilation or the *level of an amputation does not constitute an infallible index as to the measure of the resultant disability.*

This is the more regrettable, in that the assessor, in grading *military pensions*, though he recognize the intrusion of the many other factors that may enhance the degree of disablement in any given mutilation or amputation, cannot allow such to be reflected in his assessment thereof. The degrees of the disablement are fixed, and the amount of the pension also. His "not to question why," his only to note the level, and rate the incapacity as laid down in the Schedule. It matters not whether the *stump be good or bad, sensitive or painless, friable or callous, easily fitted with an artificial limb or unadaptable thereto.*

Presumably the authorities salve their conscience by assuming that all amputation stumps—whate'er their manifold defects—will ultimately attain a state of ideal perfection, and that no soldier thus mutilated will be discharged until this desirable end be achieved. Yet treat we ever so wisely, there will inevitably emerge differences in the degree of *residual disablement* after amputations at *identical levels*, and herein lies the injustice of not only adopting but maintaining a *flat rate of evaluation*—one irrespective of even the clinical individualities of each particular case.

Still, if the authorities, as judged by their Schedule, have apparently overlooked the important factors other than levels, and moreover have disallowed their assessors the power of exercising any discrimination in this sphere, it does not absolve

us from indicating and discussing the many considerations that call for analysis. Reflection on these would, however, be well postponed till later, when we come to deal with *compensation* awards for these self-same amputations in victims of "industrial accidents." Moreover, in their instance the law permits—nay, demands—the exercise of a larger measure of discrimination at any rate *re* the disablement in relation to earning capacity.

Before proceeding to this aspect of the subject we would interpolate (1) the Schedule of Specific Injuries as laid down in the Royal Warrant of 1918; and (2) those particular assessments in the French "Guide Barème" that relate to amputations or mutilations in the extremities.

FIRST SCHEDULE

*Pensions that may be granted for Specific Injuries*

| Degree of Disablement. | Specific Injury. | Proportion corresponding to Degree of Disablement. | Disablement Pensions. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | If not entitled to a Service Pension. | | | | | Warrant or N.C. Officers entitled to Service Pensions. | Private, etc. (Class V), irrespective of Service Pension to which entitled. |
| | | | Warrant Officer, Class I. | Warrant Officer, Class II, or N.C. Officer, Class I. | N.C. Officer, Class II. | N.C. Officer, Class III. | N.C. Officer, Class IV. | | |
| | | Per cent. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| 1 | Loss of two or more limbs<br>Loss of an arm and an eye<br>Loss of a leg and an eye<br>Loss of both hands or of all fingers and thumbs<br>Loss of both feet<br>Loss of a hand and a foot<br>Total loss of sight<br>Total paralysis<br>Lunacy<br>Wounds, injuries, or disease resulting in disabled man being permanently bedridden<br>Wounds of or injuries to internal, thoracic, or abdominal organs, involving total permanent disabling effects<br>Wounds of or injuries to head or brain involving total permanent disabling effects, or Jacksonian epilepsy | 100 | 42 6 | 37 6 | 35 0 | 32 6 | 30 0 | 27 6 | 27 6 |

FIRST SCHEDULE—*continued*

| Degree of Disablement. | Specific Injury. | Proportion corresponding to Degree of Disablement. | Disablement Pensions. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | If not entitled to a Service Pension. | | | | | Warrant or N.C. Officers entitled to Service Pensions. | Private, etc. (Class V), irrespective of Service Pension to which entitled. |
| | | | Warrant Officer, Class I. | Warrant Officer, Class II, or N.C. Officer, Class I. | N.C. Officer, Class II. | N.C. Officer, Class III. | N.C. Officer, Class IV. | | |
| | | Per cent. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| | Very severe facial disfigurement<br>Advanced cases of incurable disease | 100 | 42 6 | 37 6 | 35 0 | 32 6 | 30 0 | 27 6 | 27 6 |
| 2 | Amputation of right arm at shoulder joint | 90 | 38 3 | 33 9 | 31 6 | 29 3 | 27 0 | 24 9 | 24 9 |
| 3 | Amputation of leg at hip or left arm at shoulder joint<br>Severe facial disfigurement<br>Total loss of speech | 80 | 34 0 | 30 0 | 28 0 | 26 0 | 24 0 | 22 0 | 22 0 |
| 4 | Short thigh amputation of leg or of right arm above or through elbow<br>Total deafness | 70 | 29 9 | 26 3 | 24 6 | 22 9 | 21 0 | 19 3 | 19 3 |
| 5 | Amputation of leg above knee (other than 4), and through knee or of left arm above or through elbow, or of right arm below elbow | 60 | 25 6 | 22 6 | 21 0 | 19 6 | 18 0 | 16 6 | 16 6 |
| 6 | Amputaton of leg below knee (including Symes' and Chopart's amputation), or of left arm below elbow<br>Loss of vision of one eye | 50 | 21 3 | 18 9 | 17 6 | 16 3 | 15 0 | 13 9 | 13 9 |
| 7 | Loss of thumb or of four fingers of right hand | 40 | 17 0 | 15 0 | 14 0 | 13 0 | 12 0 | 11 0 | 11 0 |
| 8 | Loss of thumb or of four fingers of left hand, or of three fingers of right hand | 30 | 12 9 | 11 3 | 10 6 | 9 9 | 9 0 | 8 3 | 8 3 |
| 9 | Loss of two fingers of either hand | 20 | 8 6 | 7 6 | 7 0 | 6 6 | 6 0 | 5 6 | 5 6 |

NOTE.—In the case of left-handed men, certified to be such, the compensation in respect of the left arm, hand, etc., will be the same as for a right arm, hand, etc.

## FRENCH "GUIDE BARÈME"

*Rates of Evaluation in Mutilations or Disarticulations*

### Amputation of Two Limbs

| | Per cent. |
|---|---|
| The loss of two limbs, whatever be the combination, involves total incapacity | 100 |

### Upper Limb

| | |
|---|---|
| Disarticulation of either arm at the shoulder | 80 |
| Amputation of either arm | 70 |
| Disarticulation of either forearm at elbow | 70 |
| Amputation of either forearm | 70 |
| Amputation or disarticulation of either hand | 70 |

The rates of evaluation in amputation or disarticulation of the digits at different levels are, unlike the British Schedule, given with a degree of differentiation which can only be characterized as meticulous. Albeit we would reiterate our hope that our own Pension Authorities would strive to emulate the same, and so make good a glaring deficiency in our own schedule.

### Right Hand

*Amputation or Disarticulation*

| | Per cent. |
|---|---|
| *Thumb :* | |
| Ungual phalanx | 10 |
| Two phalanges | 20 |
| Two phalanges, with corresponding metacarpal (A metacarpal is generally assessed at 5 per cent.) | 30 |
| *Index :* | |
| Ungual phalanx | 5 |
| Two phalanges | 12 |
| Three phalanges | 15 |
| *Middle :* | |
| Ungual phalanx | 2 |
| Two phalanges | 5 |
| Three phalanges | 10 |
| *Ring :* | |
| Ungual phalanx | 2 |
| Two phalanges | 5 |
| Three phalanges | 10 |
| *Little :* | |
| Ungual phalanx | 2 |
| Two phalanges | 5 |
| Three phalanges | 10 |
| Two digits, with simultaneous ablation of corresponding metacarpals : | |
| Thumb, index | 50 |
| Index, middle | 40 |
| Middle, ring | 30 |
| Ring, little | 20 |

RIGHT HAND—*continued*

| | Per cent. |
|---|---|
| Three digits, with simultaneous ablation of their metacarpals: | |
| Thumb, index, middle | 60 |
| Index, middle, ring | 50 |
| Middle, ring, little | 30 |
| Three digits non-contiguous, without loss of metacarpals: | |
| Thumb, index, ring | 50 |
| Thumb, index, little | 50 |
| Thumb, middle, ring | 40 |
| Thumb, middle, little | 40 |
| Thumb, ring, little | 40 |
| Index, middle, little | 35 |
| The last four digits | 55 |
| The first four digits, including thumb | 60 |
| Loss of all digits | 70 |
| *Sundry Fingers in Both Hands:* | |
| All the digits of both hands excepting one only | 100 |
| Both thumbs | 50 |
| Both thumbs and one index | 60 |
| Both thumbs, index, and middle | 70 |
| Both thumbs and three other digits | 80 |
| Both thumbs and both index fingers | 80 |
| *Partial and Simultaneous Ablation of Two Digits:* | |
| One phalanx of the thumb and two phalanges of the index | 20 |
| One phalanx of the thumb and two phalanges of the index with limitation of mobility of the stump | 30 |
| Two terminal phalanges (index and middle) | 10 |
| Two terminal phalanges (middle and ring) | 5 |

LEFT HAND

*Amputation or Disarticulation*

| | |
|---|---|
| *Thumb:* | |
| Ungual phalanx | 5 to 10 |
| Two phalanges | 15 |
| Two phalanges, with corresponding metacarpal | 25 |
| *Index:* | |
| Ungual phalanx | 5 |
| Two phalanges | 10 |
| Three phalanges | 12 |
| *Middle:* | |
| Ungual phalanx | 1 |
| Two phalanges | 3 |
| Three phalanges | 5 |
| *Ring:* | |
| Ungual phalanx | 1 |
| Two phalanges | 3 |
| Three phalanges | 5 |
| *Little:* | |
| Ungual phalanx | 1 |
| Two phalanges | 3 |
| Three phalanges | 5 |

LEFT HAND—*continued*

| | Per cent. |
|---|---|
| Two digits, with simultaneous ablation of corresponding metacarpals: | |
| Thumb, index | 40 |
| Index, middle | 30 |
| Middle, ring | 20 |
| Ring, little | 10 |
| Three digits, with simultaneous ablation of their metacarpals: | |
| Thumb, index, middle | 50 |
| Index, middle, ring | 40 |
| Middle, ring, little | 20 |
| Three digits non-contiguous, without loss of their metacarpals: | |
| Thumb, index, ring | 40 |
| Thumb, index, little | 40 |
| Thumb, middle, ring | 30 |
| Thumb, middle, little | 30 |
| Thumb, ring, little | 30 |
| Index, middle, little | 30 |
| The four last digits | 45 |
| Four first digits including thumb | 50 |
| *Partial and Simultaneous Ablation of Two Digits:* | |
| One phalanx of thumb and two phalanges of index | 10 |
| One phalanx of thumb and two phalanges of index, with limitation of mobility of stump | 20 |
| Two terminal phalanges of index and middle | 5 |
| Two terminal phalanges of middle and ring | 5 |

LOWER LIMB

| | |
|---|---|
| Disarticulation at the hip | 80 |
| *Amputation of Thigh* | |
| (*a*) At lower third | 60 |
| (*b*) At upper third | 70 |
| Disarticulation at the knee | 60 |
| *Amputation of Leg* | |
| (*a*) At *lower third* with good stump, a sound and well-placed cicatrix allowing of the fixation of a true artificial limb | 60 |
| (*b*) At *upper third* at site of election | 60 |
| Disarticulation at ankle joints | 60 |
| *Disarticulation at Tarsal Joints* | |
| (*a*) Medio-tarsal (so-called Chopart), leaving only calcaneum and astragalus, given sound stump with adequate mobility | 30 |
| In the absence of these desiderata | 60 |
| (*b*) Sub-astragaloid and Ricard's method. In the first, the calcaneum is ablated and the astragalus left; in the second, the procedure is reversed; the calcaneum retained and the astragalus removed | 40 |

*Metatarsals*

| *Amputation or Disarticulation* | Per cent. |
|---|---|
| (*a*) Of one metatarsal | 5 to 10 |
| (*b*) Of the two first metatarsals | 20 |
| (*c*) Of the three last metatarsals | 25 |
| (*d*) Of all the metatarsals (Lisfranc's operation) | 30 |

THE TOES

| *Amputation or Disarticulation* | |
|---|---|
| *Big Toe :* | |
| One phalanx | 5 |
| Two phalanges | 10 |
| Two phalanges and corresponding metatarsal | 15 to 20 |
| *Other Toes :* | |
| One phalanx | 0 |
| Toe as a whole | 3 to 5 |
| *All the toes* | 30 |

## EVALUATION OF MUTILATIONS IN INDUSTRIAL ACCIDENTS

Passing from the military to the *civil* sphere the assessor is less trammelled, can exercise some measure of *discrimination* in estimating the significance to the victim of loss of a limb or limbs. Deprived of one or more members—what are the *functional* disabilities entailed upon the individual? Assuredly—given even *identical* mutilations—*not the same for all men*, and this the more emphatically if viewed in light of the particular *vocation* followed. Herein resides at once the intricacy, and no less the interest, of the problem that confronts the assessor in cases coming up for redress under the Workmen's Compensation Act. Every individual instance must be judged in light of two factors: (*a*) *its clinical characteristics*, (*b*) *its professional significance.*

### (*a*) Clinical Characteristics

It will simplify our task if we realize at once that the results of an amputation, *surgically* speaking, may be ideal, yet disastrous from the orthopædic, the *prosthetic* standpoint. In other words, the amputation—despite its academic perfection—may fail of its true end. The stump may be such that no artificial limb can be conveniently or satisfactorily affixed thereto. The contrary, too, may of course happen—the intrinsic defects of the artificial limb may be such as render it *unutilizable*, even given the best stump possible. But to resume our thread—an amputation having been performed, what factors, *qua the stump*, must be taken

into consideration in attempting to appraise the measure of the *resultant disability*? We must consider (*a*) the level of the amputation, (*b*) the character of the stump.

### *The Level of the Amputation*

Judged in relation to the all-essential *artificial limb*, the various types of amputation offer relative advantages and disadvantages. These have been very clearly brought out by Openshaw, Muirhead Little, and others, and to their general conclusions we turn for guidance in this still somewhat controversial issue.

### *Upper Limb*

It is comforting to reflect that, no matter whatever the amputation or mutilation undergone in the upper extremity, an artificial limb can always be adjusted. Even in a *forequarter* amputation the resultant scars may be sufficiently resistant to tolerate the application of a shoulder cap with its attached artificial arm, allowing performance of certain movements.

In amputations at the *shoulder* certain differences obtain. Given complete removal of the *head*, an artificial arm can be more easily affixed than if severance has been effected through the *surgical neck*. Amputations in the *upper third* of the arm are unhappily situated—this even when performed as low down as the junction with the middle third. The length of bone left to project below the axillary folds is so meagre that but little purchase is obtainable for the socket of an artificial arm. "It is difficult," says Openshaw, "to fit an artificial limb to a stump which projects only one inch below the fold of the axilla, but it is still more difficult to fit one where the stump does not project at all." To lessen the mechanical inaptitude, the folds of the axilla, including portions of the pectoralis major and teres major, have been removed with good effect. According to this authority the *site of election* (*qua* the artificial limb) is between a point $1\frac{1}{2}$ inches above the elbow joint on the one hand and 3 inches below the fold of the axilla on the other.

Amputations through the *elbow joint* are prejudiced by the same drawbacks that attend *disarticulation* in other joints, and this, moreover, to an exceptional degree. Here it will suffice if we comment on the difficulties after such procedure in affixing an artificial arm. Muirhead Little is of opinion that if it is impossible to get a forearm stump extending at least $1\frac{1}{2}$ inches below the insertion of the tendon of the biceps, amputation *above* the condyles of the humerus is to be preferred.

As to the *forearm*, the lower third is *not* a favourite site, and better stumps ensue when amputation is performed through the *middle third*. Best, moreover, according to Openshaw, if the bones are divided at the *lower* end of the middle third. For a powerful useful stump, not too long and admitting of pronation and supination, is thus secured. Stumps in the *lower third* are apt to be cold and cyanotic with tightly stretched adherent scars, not to mention the too-frequently associated coalescence of the two bones with resulting loss of rotary movements which must then be carried out at the *shoulder* joint instead of the radio-ulnar joint. Stumps in the *upper* third present almost insuperable difficulties owing to their constant tendency to slip out of the artificial forearm bucket. A man with such a short forearm stump is considerably more inconvenienced than if the arm had been taken off *above* the condyles of the humerus.

Coming down to that most important level, the *wrist joint*, Openshaw observes that "it should not be done if it is at all possible to leave any portion of the hand, for it gives too long a stump for the proper application of an artificial hand." It involves putting "the artificial wrist joint at the end of the natural wrist joint, and this brings the hand too far away from the elbow, and much power is lost." He, therefore, in the case of officers or persons engaged in *clerical* pursuits, counsels the formation of a new wrist joint fashioned by the removal of $1\frac{1}{2}$ inches of the radius and ulna. To the joint thus procured an artificial limb can be affixed, and in this way the flexion of the interphalangeal joints of the index and middle fingers ensured. Moreover, the forearm being thus shortened, the power of the elbow flexors is enhanced, and the efficiency of the hand correspondingly increased.

In amputations below the *wrist*, Muirhead Little delivers himself as follows: "Below the wrist, if the carpus and base of the metacarpus can be saved, it is worth while, provided movement is preserved. The short stump thus formed can be used to activate a movable thumb with considerable force by means of a simple appliance."

As to amputations of the individual *digits*, it is an axiom that any portion of a *finger* or *thumb* is worth saving. The relics, however meagre, are more useful than any apparatus, let there be only one finger or thumb. "It is easy," says Muirhead Little, "to fit a stump to which it can be opposed, and thus to give the picking-up action and the power of holding a pen."

*Lower Limb*

*Amputations of the Thigh: Upper Third.*—Both Muirhead Little and Openshaw are at one in emphasizing the difficulties of fitting an artificial limb in these cases. Thus the former asserts: "I do not hesitate to affirm emphatically that in the lower extremity exarticulation or amputation between the trochanters is better than amputation of the upper third of the thigh." Again, the latter is of opinion that "amputations in the upper third of the thigh, where the bone is divided at any point between the small trochanter and two inches below it, gives a stump wellnigh impossible to fit with an artificial limb." Openshaw, like Muirhead Little, thinks it more feasible to fit an artificial limb after *exarticulation* than where section has taken place at the great trochanter or at the small trochanter. Of course the crux of the difficulty in these cases is that, no matter how light the limb, it is beyond the power of the short stump to transmit sufficient force to achieve adequate movements.

*Middle Third.*—Muirhead Little states that this is the level at which the operation is performed in 42·8 per cent. of the cases recently treated at Roehampton. In amputations of the *thigh* one of the greatest obstacles presented to fixation of an artificial limb is the presence of *flexion contracture*, with or without abduction. The ultimate efficiency of the limb will depend on how far these have been removed by physical therapy or operation.

*Lower Third.*—It is at this level, either just above or through the condyles, that we obtain the best stump for the affixing of an artificial limb.

*Amputations in the Leg.*—According to Muirhead Little, the most favourable site is the lower part of the *middle* third, but Openshaw inclines to one in which the bone is divided from four to five inches from the upper edge of the tibia. The latter observes that after this amputation, "with a well-fitting artificial limb the patient can walk, run, and dance in such a way as to render it absolutely impossible even for an expert to decide which leg is artificial."

But both agree that amputation in the *lower* third of the leg gives an unsatisfactory stump: one not only in which the skin is apt to be cold and ill nourished, but, more important, its end-bearing capacities are deficient.

*Amputations in the Neighbourhood of the Ankle Joint.*—Both these authorities concur in giving the palm to Syme's operation, laying stress on the technique laid down by its originator being strictly followed. It affords a good painless weight-bearing

stump. If in accordance with this only the malleoli and a layer of the tibia a quarter of an inch thick are removed, it affords scope for the play of a joint in the artificial foot itself instead of the lateral steel supports. If badly performed a condition of *varus* may ensue, not to mention the fact that, as Little points out, " too low a section leaves no room for a strong transverse ankle joint, and a too voluminous heel flap means an unsightly artificial foot and boot."

As regards the ultimate usefulness of an artificial foot neither a sub-astragaloid nor a Pirogoff, nor for that matter does a Chopart offer any advantage over a Syme. In Pirogoff's, as in the sub-astragaloid, as Openshaw points out, " the lowest end of the leg is pointed and irregular, the stump is too long, and the artificial foot so narrow as to prevent the ankle joint being fixed in the artificial foot itself." In a Chopart too—healing by granulation—the friability of the resulting scar is such that the *end-pressure* cannot be tolerated, and resort to Syme's procedure is imperative.

In amputations of the *digits* an artificial foot is easy of adjustment provided the bone ends are well covered and the scar located on the *dorsum* of the foot.

### *The Character of the Stump*

All surgeons in performing an amputation have, or should have, an eye to the all-important end operation—the ultimate adaptation to the stump thereof of the often delicate and complicated artificial limb. The end-result of the operation is a stump more or less efficient, and how essential the same is may be gathered from the frequency of the operations, more or less radical, subsequently undertaken simply and solely to prepare or improve the same so that an artificial limb can be satisfactorily affixed thereto. The final industrial capacity of the victim will be proportional to the ultimate efficiency of the stump—its *adaptability* for application of an artificial limb thereto.

What then—apart from the previously discussed level of the amputation—are the *chief desiderata in regard to a stump* ?

Whether in the upper or lower extremity, it must be such as admits of the retention *in situ* of the appliance both when in action and when at rest as against the pull of gravity. This having been attained, one has to consider the different nature of the strains imposed upon the stump in the *upper* as opposed to the *lower* limb. In the *former* it will be constituted by the leverage essential for the performance of its complex functions—prehension and traction. Moreover, inasmuch as *end-pressure* in

the upper limb does not come into play, it is not the *terminal*, but the *anterior* and *external* surfaces of the stump that bear the brunt of the strain incurred through the pressure of the bucket. Leverage, too, in the *lower* limb is brought into play, but here we have also the added factor of *end-pressure*. A leg stump finds its *point d'appui* upon the *terminal* extremity (end-bearing) or upon bony prominences *contiguous to the proximal joint* (ischial tuberosity or head of tibia). The strain involved in *end-bearing* is a variable quantity. This, as Elmslie points out, "not only in stumps at different levels, but also in individual stumps at the same level." The ideal type of end-bearing stump is that left after Syme's amputation.

So much for the lines of *mechanical stresses* and *strains* in stumps, and now to note how the *physical* characters thereof favour or prejudice its efficiency in these respects.

*Length* is an all-important consideration if we recall the obstacles to leverage presented by amputations in the upper third of the *arm*, and for that matter those located near the *hip*. In other words, *ceteris paribus*, an ideal amputation stump should reach a certain length. As to *conformation*, a too *conical* stump is a disadvantage which need not be dilated upon. In amputations in the *thigh* Muirhead Little observes that "if the great adductor muscles are allowed to retract too much, a too conical stump results and the bunch of soft parts at the top of the thigh just below the pubis forms a serious obstacle to the fitting of the socket." On the other hand, *too great bulk of the soft parts* is an obstacle, and when these are too voluminous the difficulty of fitting satisfactorily an artificial limb is accentuated. Such, for example, is not uncommon in amputations through the thigh. In a case recently seen by us in which the bone was divided just below the knee, the voluminousness of the stump precluded the affixing of an artificial leg.

*Mobility.*—An ideal amputation stump should be provided with muscles, which through their attachments thereto can secure its movement with vigour. Needless to add that the contiguous *joints* should be likewise mobile, though frequently in *war injuries* through prolonged immobilization and infective processes more or less fixation ensues. Thus, for instance, flexion contracture of the hip, flexion of the knee, and adduction of the shoulder are not uncommon, all constituting obstacles to the fixation and mobilization of an artificial limb.

The action of attached muscles is not always salutary. For example, although a good bearing surface may be forthcoming in a *Chopart's* amputation, yet all is undone by the action of the calf muscles. These pull up the heel, tilt the lower end down,

and painful pressure on the scar results. Again, in *short forearm* stumps, the biceps tendon when it contracts in flexion tends to lever the stump out of the bucket.

### *Characters of the Scar*

*Site of the Scar.*—It should be in a position not exposed to pressure. In end-bearing stumps such as a Syme's, it should not be *terminal* in location. Similarly in *digital* amputations the ideal position is upon the *dorsum* to avoid friction or traumatisms.

On the other hand, in the *upper* extremity, *end-pressure* being excluded, the terminal situation of a scar need not be a drawback at certain sites. In the *arm* after guillotine amputations terminal scars are not a source of trouble. The sites exposed to pressure by the bucket are the *anterior* and *external* surfaces. Consequently scars located thereon would be exposed to these prejudicial factors, pressure and friction. It is for this reason that in *disarticulation* of the shoulder Muirhead Little advises that the incisions of resulting scars should not infringe upon the clavicle and the bony processes of the acromion—subjected as these will be to the pressure of a shoulder cap.

*Non-adherence of Scar.*—A scar should be *movable*, as also the soft parts underlying it. It should not be *adherent* to the bone, though here again such is not so marked a drawback at some sites as at others. Thus Muirhead Little states that " many arm stumps with large adherent guillotine scars covering the end of the bone had been found to be quite satisfactory in practice." Dragging upon adherent scars, with resulting pain, is indeed seldom a source of trouble in the upper limb. On the other hand, it is frequently complained of in the *lower* limb owing to the upward thrust of the artificial limb.

*Painlessness.*—The scar should not be *tender* or *painful*. It will, however, be so if the nerves be adherent thereto, or if the nerve-endings become *bulbous*. Additional sources of pain are *sequestra*, *projecting spurs of new bone*, or an *occult abscess*. Other sources of irritation are puckering and inversion of the scar, with its associated liability to *eczema*. Also it may be remarked that in leg stumps, as Huggins points out, the scar—after wearing an artificial limb—is apt to break down through the *softening* which ensues in sequence to *decomposition of the sweat*. Lastly, needless to say, the presence of *sinuses* renders a stump, if not unsuitable, at least unready for the time being for the application of an artificial limb. Albeit, lest care be taken to exclude occult *sequestra* by X-rays, their extrusion with a resultant sinus may follow the wearing of an artificial limb.

*Summary*

As consideration of the foregoing factors renders clear, each case as regards its *clinical characteristics* must be weighed *individually.* The all-important point to ascertain is the degree to which the functions of the lost limb can be compensated for by an artificial substitute. To what extent have the end-results of the amputation realized reasonable perfection, or to what extent have they fallen short thereof. Briefly characterized, as Muirhead Little succinctly states, the following are the *desiderata of a perfect stump* :

" An ideal amputation stump would be as long as possible to be covered by sound movable soft parts, and the scar would be placed in a position where it would not be exposed to pressure, and it would also not be adherent to the bone. It would have enough muscles attached to it to move it with adequate force, and no inflamed or hypersensitive nerve-ends would be palpable in it. The end or ends of the bone or bones would be rounded so as not to hurt the soft parts under them, and the blood supply would be free and the skin well nourished."

With this as our ideal it is palpable that, as far as the clinical characteristics of an amputation stump bear on functional or industrial capacity, the nearer the above desiderata are of attainment, the less will be the relative degree of residual disability. On the contrary, the further these ideal conditions are departed from, the greater the difficulty of fitting an artificial limb, and the higher the degree of residual disablement. It is clear, then, that any attempt at evaluation of the measure of disability occasioned by the loss of a limb or part of a limb must take as its basis the aforesaid clinical characteristics and the figures of assessment must be elevated or lowered according to the degree of their realization. The Tables that we append of the findings in *civil* courts of all countries, present, as we see, *maxima* and *minima.* Doubtless the differences in evaluation reflect the varying clinical peculiarities of the cases seeking redress. Moreover, into the same process of evaluation has entered the all-important factor—the functional effect of the mutilation as viewed in light of the victim's *vocation*—an effect, moreover, which finds expression in unimpaired or diminished earning capacity.

### (*b*) Professional Significance

It must always be conceded that loss of a limb predicates an irremediable flaw in the *anatomical* integrity of the individual. Unfortunately, limbs once lost do not undergo spontaneous

regrowth, and as the defect is permanent, so also must there be redress in the form of some *minimal permanent compensation.* We use the word minimal advisedly. For while the man's loss *anatomically speaking* is permanent, it does not, as we have elsewhere remarked, remain stationary, unmitigated for all time. This at any rate in the *functional* sense. For even as a man after loss of an *eye* may in time become oblivious of his deprivation, so also, at any rate in minor mutilations of the limbs, does the same relative unconsciousness of his anatomical flaw gradually overtake him. For not the least of the healing influences of Time is the *adaptation* to disability that automatically ensues with its passage.

In light of this, therefore, when we speak of estimating the *professional significance* of the loss of the limb to the victim, we are, so to speak, looking at it from the wrong standpoint. It may, of course, be true that the loss of a leg may be more keenly felt in some occupations, and yet in another the loss of an arm may be more of a deprivation. Thus, as Julliard remarks, a machinist—once adaptation is realized—can, without great economic depreciation, accomplish his work with an artificial leg. But, he adds, it is otherwise with an agriculturist. This, however, seems doubtful when we note with what avidity men thus mutilated seek for outdoor occupations of this nature.

Turning, however, from such controversial aspects of the subject, we are on safer ground if we maintain that, relatively speaking, persons who have suffered loss of an upper limb, or both, or portions thereof, have more to complain of than those who have sustained similar mutilations in the *lower* limb. Thus amputations in the lower limb do not obviate the pursuit of the majority of so-called workshop trades, tailors, shoemakers, and so on. Gardeners, horticulturists, can also prosecute their work with the aid of an artificial limb.

These differences, in so far as they obtain in regard to the upper and lower limbs, are *au fond* referable in large part to the difficulty of providing an efficient *artificial substitute* for the upper limb. Thus, Carle of Lyons makes the pregnant observation: "If I make a surprise visit into the workshop of stitchers or millboard workers I am frequently incensed on seeing that they have deliberately placed on the table their artificial arm, enlisting, however, with such persistency and ardour the help of the stump, that I have almost given up demanding such an adjunct save in special cases."

What more significant proof than this could be adduced of the vital value of this beneficent factor—*adaptation*—automatically and persistently operating to reduce the degree of *residual disability* attaching to mutilated individuals.

All the foregoing observations must be read in light of our previous discussion of this cogent biological ally in our chapter on "Adaptation." The salient factor, then, to be ascertained in estimating the degree of residual disability is the measure of *adaptation* realized. The German Imperial Assurance Office admits that such adaptation, when achieved, *constitutes improvement in the legal sense*, and according to its degree justifies the abolition or diminution of annuities after variable periods.

## Adaptation in Relation to Pensions for Mutilations or Amputations

We have before insisted that a logical adherence to pension awards, namely, that they should be *in proportion to the degree of disablement*, entails, *ipso facto*, recognition of this biological fact. On this basis, therefore, it is illogical that a *flat* rate of evaluation should have been accorded in mutilations—more accurately speaking, that such should be *unalterable*. Granted that in a purely *physiological*, as opposed to a professional evaluation, all disabled soldiers should, when the subjects of identical mutilations, be assessed at a flat rate, it is, we think, inconsistent if not unfair—as between man and man—that they should be immune from *revision*. With the passing of time their *varying adaptive capacities* find expression. Some continue much more disabled than others. On the other hand, others more adaptable may by comparison be found in receipt of a pension "in excess of the extent of their disablement."

We would commend this aspect of mutilations—the *adaptive capacity of individuals* thereto—to the notice of the Pension Authorities, as it appears to have wholly escaped their notice. This the more in that the Minister of Pensions is now endowed with the power of ordering a *revision of any pension* that has "by error in interpretation or fact been granted to a disabled man in excess of the amount appropriate to the degree of his disablement."

Now is it, may we ask, contended that this power should be exercised in regard to *all* soldiers alike, or are there to be exceptions made in the case of those, the victims of the *particular mutilations* specified in the Schedule of Injuries? If so, it is clearly unfair, and no more potent cause of discontent than such *sectional* or *selective* action on the part of the Ministry can possibly be imagined. This brief digression seems not uncalled for, and in view of the scant attention paid to the *economic* significance of *functional adaptation*, at any rate in this country, we take the opportunity now, as in other lesions, of showing the practical

manner in which the German Imperial Assurance Office shows its appreciation of this too frequently overlooked adjunct to functional restoration.

*Periods of Adaptation in Amputations as laid down by the German Imperial Assurance Office*

Because of their paramount importance and the consequent greater attention paid to them we shall in the first instance deal with their findings in this respect as relating to mutilations of the *hands*.

## The Hand

The authorities submit that objective proof of the accomplishment of adaptation may be affirmed in all lesions of the hand under the following conditions:

If *callosities* have developed in the neighbourhood of the lesion, especially if located at *unusual* sites—indicative, therefore, of the acquisition of new and compensatory movements.

Also if the *muscles* of the forearm have regained their *normal* size, and, lastly, if the *sensitiveness* of the stumps or injured parts has disappeared.

Suppression of the annuity after a certain period in slight mutilations of the fingers is held by them to be justified, and automatically ensues. With this reservation, that in mutilations of the *thumb*, though *reduction* may be practised, complete withdrawal of the annuity is held unjustifiable on the ground that there always exists a certain measure of residual disability after such a loss.

They attach great importance to the *youth* of the individual as favouring the achievement of adaptation, while in regard to *sex*, they generally allow a longer period for women. Indeed, in their case, in some instances, they continue the annuity even when adaptation is held as accomplished.

Right Thumb

| Lesion | Period of Adaptation |
|---|---|
| Loss of 8 millimetres of right thumb | 2 years |
| „ half of ungual phalanx | 3 „ |
| „ two-thirds of ungual phalanx with limitation of mobility of other joints | 15½ „ |
| Total loss of ungual phalanx | 1¾–21¼ „ |
| „ „ „ „ and quarter first phalanx | 20 „ |

It is very significant that adaptation is more swiftly achieved in cases *compensated by a lump sum* than in those in receipt of an *annuity*. Thus, Julliard, in regard to the foregoing type of

mutilations, noted that in Swiss subjects adaptation ensued in less than a year after the accident. In other words, the victims (chiefly machinists and cabinet-makers) declared themselves in no way inconvenienced in their work, and in less than a year were earning the same if not higher wages. Julliard has met with several cases of *total loss of the right thumb* which in no way militated against a progressively increasing earning capacity. Adaptation in the case of a mason, a workman, a joiner, and a jeweller was realized within at most a few years. It may be noted that these observations of Julliard related to cases of pure mutilation without suppuration or other complications.

RIGHT INDEX

| Lesion | Period of Adaptation |
|---|---|
| *Ungual Phalanx :* | |
| Loss of *half*, with ankylosis of joint | 7¾–10½ years |
| „ *whole*, with ankylosis | 7 –11 „ |
| „ *whole*, without ankylosis | 11 –11¾ „ |
| „ *two* phalanges | 1¾–21 „ |
| „ *two* phalanges and half of proximal | 1½–18 „ |
| „ *whole* of index | 6½–12 „ |

Among their pronouncements in regard to mutilations of index finger, they hold that the *middle* finger very quickly replaces the functions of the index. In addition they hold that the uncomplicated loss of the two terminal phalanges of the right index does not in the majority of occupations depreciate the industrial incapacity—this at any rate when adaptation is realized.

Julliard noted here, as in the thumb, that Swiss workmen (compensation by lump sum) in total or partial loss of right index had become adapted thereto at the end of a year. But he emphasizes the fact—this only in instances of pure loss. If, however, complicated by *ankylosis*, adaptation was much more tardily realized, though never to the same extent as in German workmen (compensated by annuity).

RIGHT MIDDLE FINGER

| Lesion | Period of Adaptation |
|---|---|
| Loss of 1¼ phalanges | 1¾ years |
| „ 1⅓ „ | 1½ „ |
| „ 1½ „ | 3 „ |
| „ 2 „ | 7–16 „ |
| „ whole finger | 2½–21 „ |

Among their further reflections on mutilation of this particular digit they maintain that pure loss of one, two, or even three phalanges in this same digit does not in the long run constitute an industrial incapacity. It is only fair to add that they under-

stand by adaptation the ability to perform *hard* work, basing its attainment on the existence of callosities in the hand and marked development of the forearm muscles. This power of adaptation they refer to the fact that experience shows that given loss of the middle finger the remaining digits take on its functions.

RIGHT RING FINGER

| Lesion | Period of Adaptation |
|---|---|
| Loss of ungual phalanx | 1¼– 2 years |
| „ 1½ phalanges | 17 „ |
| „ 2 „ | 1 and 7 „ |
| „ 2½ „ | 2 and 16 „ |
| Total loss of ring finger | 1¾–19 „ |

In regard to the *ring* finger the authorities maintain that even for female household work it is not so indispensable as the other fingers. Total loss of the same in their opinion, once adaptation is realized, does not entail a permanent appreciable economic reduction of industrial capacity. In appreciating the realization of adaptation they attach great importance to *approximation* and ultimate *obliteration* of the unsightly chasm between the third and fifth fingers. They submit that in loss of the right ring finger, given the lapse of a year since healing, there exists no longer any reduction of working capacity.

RIGHT LITTLE FINGER

| Lesion | Period of Adaptation |
|---|---|
| Loss of 2 phalanges | 10 years |
| Loss of whole finger | 10–16 months<br>1¼–22 years |

It may be remarked of this, as of the previous digits, that the periods required for adaptation stand in no relation to the occupation, and which we would submit gives point to our contention that it is the individual's inherent adaptive capacity, not his peculiar occupation, that for him determines the measure of his adaptability to the consequences thereof.

In regard to the *little finger*, German authorities hold that a loss indifferently of the ungual or two or three phalanges does not as a rule after adaptation is acquired constitute any degree of permanent industrial incapacity. Not so, indeed, even if to loss of the phalanges there be superadded *ankylosis of the stump in right-angled flexion* through a faulty scar.

In Liniger's opinion, if following the loss of little finger, *partial* loss of the *metacarpal* be thereby incurred, it entails not added industrial incapacity, but, on the contrary, a more easily utilizable hand.

MUTILATIONS OF SEVERAL FINGERS OF THE RIGHT HAND

| | Adaptation after | |
|---|---|---|
| Loss of one-third of ungual phalanx of *thumb* and two phalanges of *index* | 2½ | years |
| Deformity of ungual phalanx of thumb, and loss of two phalanges of index | 18 | „ |
| Loss of ungual phalanx of *index* and *middle fingers* | 6 | „ |
| Loss of ungual phalanx and half of the second phalanx of the *index* and *middle* fingers | 2½ | „ |
| Ankylosis of *index* (one-third) and loss of *middle* finger | 4 | „ |
| Loss of two phalanges of *index* and of a phalanx of *ring* finger | 20 | „ |
| Loss of three-fourths of the ungual phalanx of *middle* and *ring* fingers | 6 | „ |
| Loss of the ungual phalanx of the *middle* and two-thirds of the ungual of the *ring* fingers | 2 | „ Suppression of annuity after 11 years |
| Loss of the ungual phalanx of the middle and ring fingers | 15 | „ Two other cases for the same occupation, 6 and 11 years respectively |
| Loss of right *middle*, slight ankylosis of *ring*, atrophy of arm muscles | 8 | years |
| Loss of *middle* finger, and partial ankylosis of *ring* finger | 15 | „ |
| Loss of middle finger, slight limitation of extension of two last digits | 7 | „ |
| Loss of ungual phalanx of fourth and fifth digits | 9 | „ |
| Loss of fifth digit, with slight ankylosis of fourth digit | 7 | „ |
| Loss of the fourth digit, with slight ankylosis of fifth digit | 11 | „ |

In regard to these more or less severe mutilations involving several fingers of the right hand, the attitude of the authorities is well defined. As a rule the annuities have on the acquirement of adaptation been reduced, though not wholly withdrawn. A minimum annuity is continued, because it is held that even though complete adaptation has ensued, nevertheless a mutilation, *per se*, places the victim at a disadvantage in the industrial market as compared with *non-mutilated* individuals.

LEFT THUMB

| Lesion | Period of Adaptation | |
|---|---|---|
| Loss of 1 cent. of terminal phalanx | 8 | years |
| „ ungual phalanx in toto | 1½–23 | „ |
| „ 1½ phalanges | 6½ | „ |

*Total Loss of Left Thumb.*—In this as in the right thumb the annuity is never wholly withdrawn, though after several years lowered to rates of 10 to 20 per cent.

In Julliard's series of cases adaptation to total loss of left thumb was attained after the lapse of a year since the receipt of the injury. He noted that their industrial capacity, as evidenced

by earnings, was not depreciated, though he admits the individual's status in the industrial market is lowered.

Loss of the *terminal phalanx*, according to German authorities, does not predicate any permanent incapacity once adaptation is realized.

LEFT INDEX FINGER

| Lesion | Period of Adaptation |
|---|---|
| Loss of 1 cent. of terminal phalanx | 7½ years |
| „ ungual phalanx | 5 „ |
| „ 1½ phalanges | 2½–9 „ |
| „ 1⅔ „ | 14 „ |
| „ 1¾ „ | 6 „ |
| „ 2 „ | 2–14 „ |
| „ 2¼ „ | 9 „ |
| „ 2½ „ | 5, 9, 20, 21, 22 „ |
| „ the whole finger | 4½, 5, 7½, 13, 15, 20 „ |

On the other hand, given coincident loss of the head of the metacarpal, with the whole of the index finger, adaptation is acquired in a much shorter period—five to eight years.

As to their further pronouncements regarding total loss of the index finger it is, they remark, compensated for in large measure by the middle finger. They definitely affirm that a man, given loss of the *ungual* phalanx of the left index, should become wholly adapted thereto in five years.

Loss of two phalanges of the index, they maintain, does not after realization of adaptation postulate any permanent incapacity. The same is true of the *loss of two and a half* phalanges or total loss of the finger, and also of the *head of its metacarpal.*

LEFT MIDDLE FINGER

| Lesion | Period of Adaptation |
|---|---|
| Loss of 2 phalanges | 2–12–20 years |
| „ 2¼ „ | 4 „ |
| „ 2¾ „ | ? „ |
| Total loss of finger | 1, 9, 10, 11, 12, 16, 17, 18 „ |

The huge disparity in the periods required for adaptation (ranging from one to eighteen years), it is interesting to note, occurs independently of the particular occupation followed, or of the age of the victim.

The authorities hold that adaptation ensues very rapidly in loss of two phalanges of the left middle finger, while even total loss of the same after the attainment of adaptation does not entail any permanent incapacity.

LEFT RING FINGER

| Lesion | Period of Adaptation |
|---|---|
| Loss of 1 phalanx | 18 months |
| „ 1½ phalanges | 1½–3 years |
| „ 2 „ | 10 months, 2, 4, 6, 7, 8 years |
| Total loss of finger | 2, 2⅓, 3, 4, 4½, 5, 6, 7, 9, 19 years |

Total loss of this finger entails no permanent incapacity after adaptation.

LEFT LITTLE FINGER

| Lesion | Period of Adaptation |
|---|---|
| Loss of 1½ phalanges . . . . | 2 years |
| „ 2 „ . . . . | 20 months, 1½, 3, 4 years |
| „ 2½ „ . . . . | 3 years |
| Total loss of finger . . . . | 1½, 2, 13, 16 years |
| Total loss of finger and half metacarpal | 3, 5, 6 years |

Total loss of finger, with or without loss of half the metacarpal, does not after adaptation entail any industrial incapacity.

## MUTILATIONS OF SEVERAL FINGERS OF LEFT HAND

We would here state that as in the right hand, annuities in such cases have been *diminished*, but never wholly withdrawn. The reasons for such continuance, even after adaptation has been admitted, are not always cited, but it may be assumed that either the period of time that has elapsed since the accident is insufficient, or more probably that the severity of the mutilations portended a *constant* inferiority in the industrial market.

We may note also the interesting point that a *left*-handed person, if after mutilation of the same, becomes proficient with his *right* hand, this should be taken as an evidence of *adaptation*, one, moreover, justifying *lowering* of his annuity.

Loss of *ungual* phalanx of left *thumb*, ankylosis of distal phalanx of index in extension, and limited flexion of the second phalanx thereof. Adaptation in 12 years.

Loss of ungual phalanx of left *index*, with slight deformity of middle finger: Blacksmith. Adaptation in 6 years.

Loss of ungual phalanx of *middle* and *index* fingers: Locksmith. Adaptation in 3 years.

Loss of ungual phalanx of *middle*, and half of ungual phalanx of *index*: Setter of gems. Adaptation in 14 years.

Loss of ungual phalanx of *middle* and *ring* fingers. Adaptation in a mason in 3½ years, a metal-worker in 8 years, a joiner in 16 years.

Loss of one and a half phalanges of *middle*, and one phalanx of *ring*: Modeller. Adaptation in 4 years.

Loss of ungual phalanx of *fourth* and *fifth* digits. Adaptation in 1½ years.

Loss of *little* finger with limitation of flexion of *fourth* digit: Mountaineer. Adaptation in 5½ years.

Loss of two phalanges of fourth digit and one and a half phalanges of the fifth: Labourer. Adaptation in 6½ years.

### Other Amputations in Upper Limb

With the exception of the hand, the details forthcoming are very meagre, and are in no sense generalizations. Some specific instances are given which are interesting.

The resultant incapacity in a painter who had lost his *right* hand was only valued at 50 per cent. because of the remarkable dexterity acquired in the left hand, so much so as to wholly compensate for the lost member.

Again, a blacksmith, the subject of a similar mutilation, suffered diminution of his annuity at the end of 1½ years—the same being lowered from 75 to 65 per cent.

Similarly in amputations of the *left* arm or hand reduction of annuity on acquirement of adaptation ensues. Loss of the left arm or hand by German authorities is rated at from 40 to 60 per cent., and in one instance in which adaptation to an artificial limb had been acquired, reduction of the annuity from 60 to 50 per cent. was held justified. It may be added that in several instances, with the lapse of a certain number of years with resultant adaptation, the annuity was lowered by from 10 to 15 per cent.

The scantiness of the records in regard to mutilations *above the level of the wrist* is not so significant an omission as may at first sight appear. For the measure of the resultant incapacity indifferently in all lesions of the upper limb, whether mutilations or otherwise, depends on the degree to which the functions of the *terminal appendage*, the hand, are compromised.

### Amputations in Lower Limb

In loss of the *great toe* complete adaptation thereto is acquired in periods varying from 1 to 4 years. This same, in loss of one or more phalanges of the *toes*, transpires in from 1 to 5 years. According to the authorities, loss of the *three middle* toes entails no permanent diminution of industrial capacity. It may be noted too, that in the case of a workman who had lost his *four outer* toes, his annuity was wholly withdrawn after a lapse of 11 years, inasmuch as adaptation thereto was held established.

As to amputations at different levels in *thigh* and *leg*, the Imperial Office holds it erroneous to submit that *adaptation* to the consequences thereof will only be realized following habituation of the subject to his *artificial limb*. Citing no reasons for such an affirmation it can only be assumed that they rest their opinion on the fact, as generally recognized, that a marvellous degree of adaptation may be acquired even in the absence of, or

prior to the fitting of, an artificial limb. This is certainly very plainly illustrated in the upper limb, as witness the frequency with which workmen provided with an artificial limb deliberately prefer to prosecute their work with the unaided stump.

In amputations of the *thigh*, following the acquirement of adaptation, annuities have been lowered from 80 to 70, or from 100 to 80 per cent.—this according to the level of the amputation.

In amputations of the leg at the *knee*, the same has been lowered after adaptation from 75 to 60 per cent.—which latter constitutes the irreducible or minimal annuity for this mutilation.

In amputations *below the knee*, after periods of adaptation ranging from 1 to 10 years or more, the annuity has been reduced from 75 to 50 per cent.—the latter an irreducible minimum. The same in Pirogoff's amputation has been lowered from 50 to 40 or even 33⅓ per cent.—the periods of adaptation to the same in workmen varying from 2 to 10 years. Lastly, in Chopart's amputation, the annuity has undergone reduction from 40 to 30 or from 33⅓ to 25 per cent.—the time required for adaptation to this mutilation in working men ranging from 3 to 6 years.*

* The Paris correspondent of the *Lancet* of August 10, 1918, contributes an illuminating summary of the fruitful results obtained in:

"*Vocational Re-education of War Invalids.*—Interesting experiments in the vocational re-education of war cripples have been carried out at Bordeaux and recently reported to the Academy of Medicine. Dr. Gourdon's observations extend over 5014 cases with loss of limb or grave and incurable injuries, of whom 73 per cent. have been able to resume their trade (with or without prosthesis) without special training: 27 per cent. required some new education or a modification of their old work. 30 per cent. only of the patients examined were disabled in the upper extremity.

In each case a careful examination of physical and psychical aptitude was made, for the war cripple varies greatly in both these respects, and it is essential to place him under the surveillance of instructors and foremen who can adapt the technical methods of a craft to the degree of intelligence, energy, and skill, as well as to the age of the cripple. 62 per cent. of the patients at the Bordeaux centre were agricultural labourers, and of all cripples the worker on the land most readily resumes his former work. He is fond of it, he knows his work thoroughly, and it is work which does not demand precise movement. Thus 85 per cent. of the gardeners were able with suitable appliances to resume work at once. Cases with loss of hand or forearm have shown practically normal output of labour: with loss of arm, 75 to 85 per cent. Among lower limb cripples, only those with amputation through the thigh showed any considerable handicap: in this case an output of 50 per cent. of the normal. Nearly all the cripples are apt at manual work, whether sitting or standing, the diminution of output not exceeding 10 per cent. Professor Bergonié is, from his own experience, strongly in favour of re-education by agricultural work, considering it greatly superior to, and more rapid in results than, all the methods of artificial physiotherapy practised in urban hospitals, the field work being continued all day and every day under the supervision and direction of doctors. In the Bordeaux area during one year, cripples undergoing the agricultural cure have furnished 107,000 days' work on the fields.

## COMPARATIVE TABLES OF AMPUTATIONS OF THE UPPER LIMB

### LOSS OF THE ARM

| French Law. | German Law. | Swiss Law. | Austrian Statistics. | Italian Law. | Finnish Law. | Brouardel. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|---|---|
| Right, 60–85 %. Left, 60–80 %. | Right, 60–75 %. Left, 60 %. | Right, 66 %. Left, 50–66 %. | Right: of 360 cases, 8 deaths. 270 = 66–83 %. 82 = total incapacity. Left: of 247 cases, 9 deaths. 217 = 66–83 %. 21 = total incapacity. | Right, 80 %. Left, 75 %. | Right, 50–75 %. Left, 40–66 %. | Right, 50–90 %. Left, 40–80 %. | Right, 75 %. Left, 65 %. | Right, 70 %. Left, 50 %, with addition of 20 % in case of disarticulation at shoulder joint. |

### LOSS OF THE FOREARM: AMPUTATION BELOW THE ELBOW

| French Law. | German Law. | Wiener Schema (Austria). | Austrian Law. | Italian Law. | Brouardel. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|---|
| Right, 70–80 %. Left, 60 %. | Right, 66–75 %. Left, 60–75 %. | Right, 66–75 %. | Left, 66–75 %. | Amputation in upper third: Right, 80 %. Left, 75 %. Amputation in lower third: Right, 70 %. Left, 65 %. | Right, 50–90 %. Left, 40–80 %. | Right, 70 %. Left, 60 %. | Right, 70 %. Left, 50 %. |

LOSS OF THE HAND

| French Law. | German Law. | Wiener Schema (Austria). | Austrian Statistics. | Brouardel. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|
| Right, 55–80 %. | Right, 50–75 %. In old people, 100 %. | Right, 66–75 %. | Right: of 231 cases, 6 deaths; 3 = 50–66 %; 141 = 66–83 %; 81 = total incapacity. | Right, 45–90 %. | Right, 65 %. | Right, 70 %. |
| Left, 50–55 %. | Left, 50–60 %. | | Left: of 186 cases, 3 deaths; 1 = 33–50 %; 10 = 50–66 %; 164 = 66–83 %; 8 = total incapacity. Mean = 66 % (Kaufmann). | Left, 30–80 %. | Left, 55 %. | Left, 50 %. |

## AMPUTATION OR DISARTICULATION OF THE THUMB

| Site of amputation or disarticulation. | French Law. | German Law. | Italian Law. | Swedish Law. | Finnish Law. | Austrian Imperial Office. | Wiener Schema. | Brouardel. | Imbert. | Remy. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Interphalangeal joint. | Right. 6–30 %. Left, 5–13 %. | Right, 10–20 %. Left, 10 %. | Right, 15 %. Left, 12 %. | — | — | 16 %. | Right, 13–16 %. | — | Right, 15 %. Left, 10 %. | Right, 6 %. Left, 4·8 %. | Right, 10 %. Left, 8 %. |
| Metacarpo-phalangeal joint. | Right, 14–60 %. Left, 10–20 %. | Right, 30 %. Left, 25 %. | Right, 30 %. Left, 25 %. | 25 % in either right or left. | Right, 20–35 %. Left, 15–30 %. | Right, 25–33 %. Left, 25–30 %. | — | Right, 15–55 %. Left, 10–40 %. | Right, 30 %. Left, 25 %. | Right, 20 %. Left, 16 %. | Right, 25 %. Left, 20 %. |
| Carpo-metacarpal. | — | — | — | — | — | — | 25–40 %. | — | Right, 35–40 %. Left, 30–35 %. | Right, 30 %. Left, 24 %. | Right, 35 %. Left, 30 %. |

## AMPUTATION OR DISARTICULATION OF THE INDEX FINGER

| Site of amputation or disarticulation. | French Law. | German Law. | Italian Law. | Swedish Law. | Finnish Law. | Austrian Law. | Wiener Schema. | Brouardel. | Imbert. | Remy. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Terminal joint. | Right, 2–12 %. Left, 0–10 %. | Right, 0–10 %. Left, 0–10 %. | — | — | — | 10 %. | Right, 0–8 %. | — | Right, 6 %. Left, 4·8 %. | Right, 6 %. Left, 4·8 %. | Right, 6 %. Left, 5 %. |
| Mid-phalangeal joint. | Right, 7–20 %. Left, 6–20 %. | Right, 10 %. Left, 10 %. | — | — | — | — | Right, 8–16 %. | — | Right, 10 %. Left, 8 %. | Right, 7·5 %. Left, 6 %. | Right, 10 %. Left, 8 %. |
| Metacarpo-phalangeal joint. | Right, 8–15 %. Left, 11–13 %. | Right, 10–15 %. Left, 10 %. | Right, 20 %. Left, 15 %. | 15 % in either right or left. | Right, 10–25 %. Left, 5–20 %. | — | Right, 16–25 %. | Right, 10–35 %. Left, 5–25 %. | Right, 15 %. Left, 10 %. | Right, 12–15 %. Left, 10–12 %. | Right, 15 %. Left, 12 %. |

## AMPUTATION OR DISARTICULATION OF THE MIDDLE FINGER

| Site of amputation or disarticulation. | French Law. | German Law. | Italian Law. | Swiss Law. | Finnish Law. | Austrian Imperial Office. | Wiener Schema. | Brouardel. | Imbert. | Remy. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Terminal joint. | Right, 3–10 %. Left, 3–10 %. | Right, 0–10 %. Left, 0–10 %. | Right, 5 %. | — | Right, 6–10 %. | Right, 1–10 %. Left, 1–10 %. | — | — | Right, 5 %. Left, 2 %. | Nil. | Nil. |
| Mid-phalangeal joint. | Right, 5–10 %. Left, 8–15 %. | Right, 0–10 %. Left, 0–10 %. | — | — | — | — | Right, 8 %. | — | Right, 8 %. Left, 6 %. | Right, 3 %. Left, 2·4 %. | Right, 5 %. Left, 4 %. |
| Metacarpo-phalangeal joint. | Right, 6–16 %. Left, 5–16 %. | Right, 20 %. Left, 15 % (Le Jurisclasseur des Acc. du Travail). Right, 10 %. Left, 10 % (according to Kaufmann). | Right, 8 %. Left, 8 %. | Right, 8–10 %. | 5–15 % in either right or left. | — | Right, 8–16 %. | Right, 5–25 %. Left, 5–20 %. | Right, 10 %. Left, 8 %. | Right, 4 %. Left, 3·2 %. | Right, 8 %. Left, 6 %. |

## AMPUTATION OR DISARTICULATION OF THE RING FINGER

| Site of amputation or disarticulation. | French Law. | German Law. | Italian Law. | Swiss Law. | Finnish Law. | Austrian Imperial Office. | Wiener Schema. | Brouardel. | Imbert. | Remy. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Terminal joint. | Right, 0–8 %. Left, 2–6 %. | Right, 0–10 %. Left, 0–10 %. | Right, 5 %. | — | Right, 6–10 %. | — | Nil. | — | Right, 5 %. Left, 2 %. | Nil. | Nil. |
| Mid-phalangeal joint. | Right, 5–10 %. Left, 5–8 %. | Right, 0–10 %. Left, 0–10 %. | — | — | — | — | 8 %. | — | Right, 8 %. Left, 6 %. | Right, 3 %. Left, 2·4 %. | Right, 5 %. Left, 4 %. |
| Metacarpo-phalangeal joint. | Right, 8–11 %. Left, 8–10 %. | Right, 15 %. Left, 0–10 % (Le Juris-classeur). | Right, 8 %. | — | Right, 5–15 %. | — | Right, 8–16 %. | Right, 5–20 %. Left, 5–15 %. | Right, 10 %. Left, 8 %. | Right, 4 %. Left, 3·2 %. | Right, 8 %. Left, 6 %. |

## AMPUTATION OR DISARTICULATION OF THE LITTLE FINGER

| Site of amputation or disarticulation. | French Law. | German Law. | Italian Law. | Finnish Law. | Austrian Imperial Office (Le Jurisclasseur des Acc. du Travail). | Wiener Schema. | Brouardel. | Imbert. | Remy. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|---|
| Terminal joint. | Right, 0–6 %. Left, 1–6 %. | Nil. | Right, 5 %. | 6–10 %. | 8–10 %. | Nil. | — | Right, 3 %. Left, 1 %. | Right, 1 %. Left, 0·8 %. | Nil. |
| Mid-phalangeal joint. | Right, 3–8 %. Left, 2–10 %. | Right, 0–10 %. Left, 0–10 %. | — | — | — | Nil. | — | Right, 6 %. Left, 4 %. | Right, 6 %. Left, 4·8 %. | Right, 5%. Left, 4 %. |
| Metacarpo-phalangeal joint. | Right, 6–8 %. Left, 3–10 %. | Right, 10 %. Left, 0–10 %. | Right, 12 %. | — | — | Right, 0–8 %. | Right, 5–20 %. Left, 5–10 %. | Right, 8 %. Left, 6 %. | Right, 7·5 %. Left, 6 %. | Right, 8 %. Left, 6 %. |
| Loss of finger and its metacarpal. | — | — | — | — | — | — | — | — | Right, 10 %. Left, 8 %. | Right, 10 %. Left, 8 %. |

## AMPUTATION OR DISARTICULATION OF TWO FINGERS OR PORTIONS OF TWO FINGERS

| Fingers involved. | Extent of loss. | French Law. | German Law. | Wiener Schema. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|
| Thumb and index finger. | Loss of the two fingers | — | 40 %. | Right, 41–50 %. | Right, 45 %. Left, 35 %. | Right, 50 %. Left, 40 %. |
| | Loss of one phalanx of the thumb and two phalanges of the index. | 11 %. | 25 %. | — | — | Right, 20 %. Left, 10 %. |
| | Loss of one phalanx of the thumb and two phalanges of the index, with limitation of movements of stumps. | 30 %. | — | — | — | Right, 30 %. Left, 20 %. |
| Index and middle fingers. | Loss of the two fingers. | Right, 34–70 %. Left, 20–35 %. | In young workmen, 12–25 %; in old workmen, 25–50 %. | Right, 25–33 %. | Right, 25 %. Left, 20 %. | Right, 25 %. Left, 20 %. |
| | Loss of the two ungual phalanges. | Right, 10–14 %. Left, 10 %. | Right, 10–20 %. Left, 10 %. | — | — | Right, 10 %. Left, 5 %. |

AMPUTATIONS OR DISARTICULATION OF TWO FINGERS OR PORTIONS OF TWO FINGERS—*continued*

| Fingers involved. | Extent of loss. | French Law. | German Law. | Wiener Schema. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|
| Index and middle fingers. | Loss of two phalanges of each finger (equivalent to the loss of two fingers in German law). | — | In young workmen, 12–25 %; in old workmen, 25–50 %. | — | — | Right, 15 %. Left, 10 %. |
| Middle and ring fingers. | Loss of two fingers. | 33–40 %. | 33–40 %. | 16–25 %. | Right, 20 %. Left, 15 %. | Right, 20 %. Left, 15 %. |
| | Loss of the two ungual phalanges. | Right, 15 %. Left, 10 %. | — | — | — | Right, 5 %. Left, 5 %. |
| | Loss of two phalanges of each finger. | — | Right, 20–30 %. Left, 15 %. | — | — | Right, 15 %. Left, 10 %. |
| Ring and little fingers: | Loss of the two fingers. | Right, 10–20 %. Left, 13 %. | Right, 20–33 %. | Right, 11–20 %. | Right, 20 %. Left, 12 %. | Right, 20 %. Left, 10 %. |

## AMPUTATION OR DISARTICULATION OF THREE FINGERS

| Fingers affected. | | French Law. | German Law. | Wiener Schema. | Ollive and Le Meignen. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|---|
| Three first fingers. | Thumb, index, and middle fingers. | Right, 30–50 %. Left, 30–40 %. | Right, 50–60 %. Left, 33 %. | Right, 50–58 %. | Right, 40 %. Left, 35 %. | Right, 55 %. Left, 45 %. | Right, 60 %. Left, 50 %. |
| Three middle fingers. | Index, middle, and ring fingers. | 40–50 %. | Right, 45–60 %. Left, 45 %. | 41–50 %. | Right, 35 %. Left, 25 %. | Right, 35 %. Left, 25 %. | Right, 40 %. Left, 30 %. |
| Three last fingers. | Middle, ring, and little fingers. | Right, 50–60 %. Left, 20–35 %. | 33 %. | 28–36 %. | Right, 30 %. Left, 25 %. | Right, 30 %. Left, 20 %. | Right, 30 %. Left, 20 %. |
| Three fingers not in juxtaposition. | Thumb, index, and ring fingers. | — | — | 50–58 %. | — | — | Right, 50 %. Left, 40 %. |
| | Thumb, index, and little fingers. | — | — | 45–53 %. | — | — | 50 %. 40 %. |
| | Thumb, middle, and ring fingers. | — | — | 41–50 %. | — | — | 40 %. 30 %. |
| | Thumb, middle, and little fingers. | — | — | 36–45 %. | — | — | 40 %. 30 %. |
| | Thumb, ring, and little fingers. | | | | | | 40 %. 30 %. |
| | Index, middle, and little fingers. | | | | | | 35 %. 30 %. |

## AMPUTATION OR DISARTICULATION OF FOUR FINGERS

| Fingers affected. | French Law. | German Law. | Wiener Schema. | Ollive and Le Meignen. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|
| Inclusive of the thumb. | Right, 60–65 %. | Right, 50–60 %. | — | Right, 60 %.<br>Left, 45 %. | Right, 65 %.<br>Left, 50 %. | Right, 60 %.<br>Left, 50 %. |
| Exclusive of the thumb. | Right, 60 %. | — | Right, 50–66 %. | Right, 45 %.<br>Left, 40 %. | Right, 50 %.<br>Left, 40 %. | Right, 55 %.<br>Left, 45 %. |

## LOSS OF SEVERAL FINGERS IN EACH HAND

| Enumeration of the particular fingers. | Wiener Schema (Austria). |
|---|---|
| Loss of all the fingers of each hand with the exception of one | 100 %. |
| Loss of two thumbs | 58 %. |
| Loss of two thumbs and an index finger | 66 %. |
| Loss of two thumbs, one index, and one middle finger | 66–75 %. |
| Loss of two thumbs and three other fingers of one hand | 75–83 %. |
| Loss of two thumbs and two index fingers | 83 %. |

## COMPARATIVE TABLES OF AMPUTATIONS OF THE LOWER LIMB

### AMPUTATION OF THE THIGH, DISARTICULATION AT THE KNEE AND HIP

| Site of amputation or disarticulation. | French Law. | German Law. | Finnish Law. | Swiss Law. | Austrian Imperial Office. | Italian Law. | Remy. | Brouardel. | Imbert. | Duchaffour. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Disarticulation at the knee. | — | — | — | — | — | — | — | — | 70–75 %. | 70–75 %. | 60 %. |
| Amputation in lower third of thigh. | — | — | — | — | — | 60 %. | — | — | 70–75 %. | — | 60 %. |
| Amputation in middle third or in upper thigh. | 65–90 % (Le Jurisclasseur des Acc. du Travail). | Provisional, 100 %. Final, average 66 %. Not exceptional, 80 %. | 60–80 %. | 50–70 %. | 66 %. | — | 50–60 %. | — | 75–80 %. | 73–75 %. | 70 %. |
| Disarticulation at the hip. | — | 85 %. | — | — | — | 70 %. | 75 %. | 50–90 %. | 85–90 %. | — | 80 %. |

## AMPUTATION OF THE LEG

| Site of amputation. | French Law. | German Law. | Italian Law. | Finnish Law. | Austrian Imperial Office. | Wiener Schema. | Remy. | Brouardel. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|---|---|---|---|
| In the lower fourth. | — | — | — | — | — | — | 25–35 %. | — | 55 %. | 60 %. |
| In the upper third. | 43–65 %; extremes of 25 and 95 % in exceptional cases (Le Jurisclasseur des Acc. du Travail). | Provisional, 75 %. Final, 50–60 %. (Kaufmann.) Latter often raised to 70 % and more in consideration of occupation and associated lesions. | 50 %. | 50–70 %. | 45–65 %. | 66 %. | — | 50–80 %. | 60–65 %. | 60 %. |

## AMPUTATIONS OR DISARTICULATIONS OF THE FOOT OR ANKLE JOINT

| Nature of amputation or disarticulation. | German Law. | Italian Law. | Le Jurisclasseur des Acc. du Travail. | Remy. | Imbert. | Brouardel. | Wiener Schema. | Suggested. |
|---|---|---|---|---|---|---|---|---|
| Lisfranc. | 35–50 % (Le Jurisclasseur). | — | 46 % (Seine Tribunal). | 18–20 %. | 20–30 %. | — | — | 30 %. |
| Chopart. | — | — | — | 20 %. | 30–35 %. | — | — | 30 %. |
| Sub-astragaloid. | — | — | — | 20 %. | 35–40 %. | — | — | 40 %. |
| Tibio-tarsal disarticulation or Syme's. | Provisional, 75–100 %. Final, 50–60 %. | 50 %. | 60–65 %. | — | 50 %. | 40–80 %. | 66 %. | 50 %. |

AMPUTATION OR DISARTICULATION OF THE GREAT TOE

| Site of amputation or disarticulation. | Remy. | Brouardel. | Le Jurisclasseur des Acc. du Travail. | Austrian Imperial Office. | German law (Kaufmann). | Wiener Schema. | Imbert. | Suggested. |
|---|---|---|---|---|---|---|---|---|
| Interphalangeal joint. | 4 %. | — | 2–8 %. | — | — | — | 4–5 %. | 5 %. |
| Metatarso-phalangeal joint. | 8 %. | — | 5–8 %. | 10 %. | 10–15 %. | 16 %. | 12–16 %. | 10 %. |
| Tarso-metatarsal joint. | 15 %. | For loss of great toe, 10–20 %, and in the case of occupations specially requiring use of lower limbs up to 40 %. | — | — | — | — | 15–20 %. | 15 %. |

## AMPUTATIONS OR DISARTICULATIONS OF THE FOUR OUTER TOES

| Nature of injury. | German Law. | Italian Law. | Swedish Law. | Austrian Imperial Office. | Wiener Schema. | Brouardel. | Remy. | Imbert. | Le Jurisclasseur des Acc. du Travail. | Suggested |
|---|---|---|---|---|---|---|---|---|---|---|
| Loss of one phalanx of one of the four outer toes. | — | — | — | — | — | — | Nil. | Nil. | 11 %. | Nil. |
| Loss of one of the four outer toes. | Nil (Kaufmann). 5 % (Le Jurisclasseur). | 5 %. (LeJurisclasseur.) | — | — | — | — | 1 %. | 3–5 %. | For amputation of 4th and 5th toes, 20 %. For loss of 3rd and 4th toes, 7 %. | 3–5 %. |
| Disarticulation of a toe with its metatarsal. | — | — | — | — | — | — | 10 % in the case of 5th toe. | Addition of 3 to 10 % to above for loss of metatarsal. | — | 10 % in the case of 5th toe. |
| Loss of all the toes. | 20–25% (Le Jurisclasseur). 10–15 % for loss of several toes (Imbert). | — | 20 %. (LeJurisclasseur.) | 30 %. (LeJurisclasseur.) | Up to 50 %. | 20 %, rising to 60 % in the case of occupations specially requiring use of the lower limbs. | 10 %. | 20–25 %. | — | 25 %. |

## CHAPTER XXV

# EVALUATION IN RELATION TO THE EYE

By W. M. BEAUMONT

### Introductory

> Earth is sick,
> And Heaven is weary, of the hollow words
> Which States and Kingdoms utter when they talk
> Of truth and justice.
>
> . . . . . .
>
> Then gently scan your brother man,
> Still gentler, sister woman.

The Romans did not give Horatius a pension of so many *sestertii* per annum, but they awarded him *the means by which he could earn his own living*—that is, they gave him a gratuity in the form of a grant of land, not an annuity, and this method of award by a "lump sum" has been continued in Italy down to the present time. In Great Britain an approximate method is adopted in the re-education of the disabled—they, too, are given a means by which they can earn their own living.

With regard to the eyes, it is very generally acknowledged that the man who has become blind in the service of his country is indeed worthy of the utmost that can be done for his welfare. But alas, if we put sight in one scale we cannot crowd the other with sufficient money to make a balance. We cannot meet the debt, we can only pay a trifle in the pound.

In civil life it would be well if the military methods of re-education were adopted or adapted for the benefit of workmen who are injured by accident in civil employment.

The awarding of pensions for wounds sustained in the service of the State is founded on the gregarious principle that we are all fellow-travellers on life's highway and that if we help others to-day they will help us to-morrow. Altruism is an instinct based on egoism, and he who refuses help in time of need is not only *hostis humani generis*, but also his own enemy.

The period of adaptation is a period of apprenticeship, and lasts as long as amelioration of the disability is proceeding, and it may be a little longer if the man has not fully acquired the

application of his tools under the altered condition of his eyes. Adaptation is complete when the details of the trade are learnt and when function has become automatic and work performed without conscious strain or difficulty. Until this state of limited perfection has arrived the man is still an apprentice and should receive a temporary pension ; when it has arrived he is a master. The time has now come, if it is found that his workmanship can never be as good as it was before his disability, to fix a permanent pension corresponding to his loss. In evaluating cases in which finality of the disease is not reached there is always one contingency to be expected, and that is—the unexpected.

The Schedule of the Royal Warrant for the Pensions of Soldiers issued in 1918 contains the following notification of grants for specific injuries of the eyes :

(1) Loss of an arm and an eye, or of a leg and an eye, 100 per cent.

(2) Total loss of sight, 100 per cent.

(3) Loss of vision of one eye, 50 per cent.

This seems a very meagre list for so important a detriment, and one which so frequently occurs in war. Of all men discharged from the army for wounds or disease, one in thirty-two is for injury or disease of the eyes.

The first disability in the schedule refers to the "loss of an eye" ; this presumably includes loss of sight of an eye even though the eye itself is not lost.

In the Pension Warrant more stress is laid upon the anatomical than on the functional loss, and as a consequence considerable difficulty arises when the special senses are evaluated. The result of considering the cause instead of the effect is that the objective damage to the eyes becomes the focus of attention instead of the subjective one of sight. The fatuity of the scheme finds expression in the provisions of the Warrant : Loss of one eye is evaluated at 50 per cent. ; *ergo*, two eyes at 100 per cent. Twice one is two. One pensioner returns to his work at the same wages as before and forgets his loss until reminded of it by his weekly pension payments ; the other does not. One sees ; the other does not. Twice one is not always two.

If a man who has previously lost one eye (or is congenitally blind in it) loses the second, or only, eye from an accident or in consequence of military duty, a differentiation between anatomical and functional loss is necessary ; for in one case he would receive the amount scheduled for the loss of an eye, but in the other he would be entitled to the equivalent for total loss of sight.

On the Continent loss of an eye, or loss of the sight of an eye, is usually evaluated at from 25 to 33 per cent.

To sum up, function is the main consideration in evaluating injuries of the eyes. If there is no eye, or no seeing eye, there is no function. If there is partial function there should be partial pension, provided the disability affects earning capacity. The degree of function is the degree of capacity, and the degree of incapacity the degree of pension.

Incapacity itself must be graded. Incapacity for what? A blind labourer may be re-educated as a typewriter and earn more money than before he lost his sight; another may be incapable of learning anything. And this leads up to the proposition that we cannot be mathematically accurate, but only approximate, in allotting gratuities and pensions, for they are personal matters which cannot be scheduled on a flat rate. Equality of assessment is not always equality of justice.

*False Imputation.*—Ocular disease frequently affects both organs, and advantage may be taken of this fact when morbid changes which are imputed to injury in one eye also exist in the other, although there is no suggestion of binocular trauma. Syphilis, for instance, produces changes which are very similar to those caused by violence, and binocularity goes far to disprove a monocular injury.

In assessing pensions the evaluation of a complicated organ of special sense, such as the eye, requires a technical investigation which differs from those methods which are called for in the locomotory and prehensile disabilities resulting from fractures, dislocations, and ankyloses.

A limb which is imperfect, either congenitally or as the result of disease or injury, usually proclaims its own deficiency; not so the eye—for no one, not even the victim, may be aware that one or both eyes is below the average standard. It follows that the first step in the evaluation is a scrutiny of all the evidence in the organ itself which bears upon its industrial value—past, present, and future. In many cases the difficulty is lessened by our knowledge of what the man's working capacity enabled him to do before the injury, and our task is reduced to a mathematical formula. If $v$ equals visual capacity before the injury and $x$ equals capacity after, what loss ($l$) has he sustained? Obviously, $v - x = l$. Let us suppose that the vision of an eye is 6/6, but that after an accident it is 6/12, his loss is 6/12 ($1 - 1/2 = 1/2$). But if originally the vision of the eye were 6/9 instead of 6/6, then his loss would be only 1/6 ($2/3 - 1/2 = 1/6$). But it is not so easy to translate this loss of vision into its equivalent loss of income, for if before the injury his sight was more than sufficient for the work he had to do, it may be that he has sufficient left after the accident to continue the same

occupation. Consequently $v - x = l$ does not apply to capacity for work, and it may be that the man has to be recompensed on a basis greater than a loss of 1/6 or even 1/2.

The loss a particular man has suffered depends upon *the nature of the work which his eyes have to perform.* Loss of sight in one eye may make no difference in the earnings of a gardener, but the work of a carpenter may be very seriously deteriorated thereby. And there are other factors requiring attention besides the *capacity.* An artiste with a traumatic squint may be just as good an actor, but a manager will decline to engage a disfigured man, and he will not be accepted in many other occupations. A woman with a traumatic cataract or a corneal scar may be refused as a waitress or as a mannequin in a draper's shop. Cosmetic defects therefore have something more than a sentimental importance; they are something more than an æsthetic loss. Whether man or woman, a disfigured person is worth less in almost all departments of the labour market, and it is therefore equitable to add on something to the pension in these cases as an equivalent for the detriment.

But vision cannot be measured by a yard-stick and test-types alone, and complaints of traumatic interference with function, whether from limitations of the field of vision, duplication, macropsia, micropsia, distortion, colour defects, or variations from normal function in any way, must receive due attention. For neither man nor woman must be unrecompensed for disability incurred in the service of his country or, in civil life, in service to an employer. Nor should there be a gain of income in such a case. Pensions are not rewards, but payments for disabilities which interfere with industrial capacity—matters of business outside and independent of compassion, sympathy, and pity.* A pensions office is not a charity organization society dispensing voluntary donations to a worthy soldier or to an industrious workman, but it is a bureau for the redemption of I O U's. Pensions should not be reduced nor forfeited as a punishment for offences unconnected with a disability, for it is the payment of a debt which the country owes the creditor for every week, month, or year during which he is unable to earn his average wages in consequence of injury caused by his work. It is not equitable to refuse to pay a debt because the creditor is a thief, a drunkard, or a forger.

It follows that if at any time the disability ceases and the man is able to earn higher wages, the pension should be reduced or cease; and, on the other hand, if at any time

* Retiring pensions after long service, which are deferred payments, are not under consideration.

the disability has increased the pension must *pari passu* be also increased.

The regulation in force for the British Army makes a pension permanent unless the disability becomes greater, when it may be increased, but does not reduce the pension when the disability diminishes or disappears. From the pensioners' point of view "Heads I win, tails you lose" has much to recommend it. It should be a first principle that a pension is only "permanent" as long as the disability is "permanent." There should be no finality to evaluation unless the disability ceases, but as the course of disease flows and ebbs, so also should the solatium rise and fall.

According to the Warrant, in the temporary stage of the pensioning the soldier is granted a minimum pension *corresponding to the degree of the disablement*, but when it becomes permanent it need not so correspond.

*Humanum est errare*, and the two following cases in succession came before a medical board: A pensioner aged thirty-eight was discharged from the Army in March 1917 for "bronchitis, pain in the back, and loss of sight." With his right eye he professed to be able to read only 6/18, but with a plane-glass he read 6/9, and with − 0·75 Cy. 6/6. In the left eye there was only perception of light in consequence of a leucoma and anterior synechia following an accident when he was five years old. There had been an external squint as long as he could remember. He had always worked on the land, but had recently given it up because he found that he could get better pay by working in a munitions factory. It was clear that his sight had not been affected by military duty, and the fact that he could do full work at munition-making negatived any serious bronchitis or pain in the back.

In the second case a private was sent home from Palestine with a diagnosis of "primary atrophy and degeneration of the optic nerve," and with vision less than 6/60. The diagnosis had been repeated through a long file of papers which made up his dossier. He was engaged as a locomotive engine-driver on the road, his vision being in the right eye with + 1 Cy. 6/18, and left eye − 1 Sp. and + 3 Cy. also 6/18. The right disc was comparatively pale, the left being normal. He had an oval central scotoma for colours, and it was found that he had smoked five ounces of black Irish twist tobacco per week since the age of fifteen (thirty-five years). Absorption was probably favoured by the very defective state of his teeth.

The first case was one of pure malingering: false ascription with regard to the injury of the eye; and the bronchitis was a false assumption, as was also the subjective pain in the back.

His symptoms were not sufficiently severe to prevent him from doing arduous work. The second case illustrates false deduction from the anatomical appearance of the disc, and lack of investigation of the subjective symptom of vision. He had tobacco amblyopia, not atrophy of the nerve.

About 10 per cent. of patients suffering from wounds and other injuries or diseases in war hospitals require ophthalmic assistance. This estimate includes, not only those in whom an ocular injury is present, but also a motley number of cases in which the eye symptoms throw light upon the general condition of the patient. Especially is an ophthalmic examination necessary in head injuries with regard to the presence or absence of papillœdema, the condition of the optic nerve and retina, irregularities of the field of vision, activity of the pupillary reflexes. But besides the brain, injuries and diseases of other internal organs—such as the heart, kidneys, etc.—may be elucidated by an examination of the eyes. Syphilis, malaria, and anæmia complicate wounds in soldiers and show themselves in various ways in the eyes or in their adnexa.

Experience on pensions boards demonstrates the necessity of thorough and accurate registration of the sight of recruits by capable examiners ; for if we have reliable evidence on this point an examination of the soldier's vision at any subsequent time will prove whether he has deteriorated in this respect during his service. And yet how lax is the testing and how seldom is the registration available ! " My sight was good," the soldier tells us, " when I enlisted or I should not have been enrolled." But examination shows in some, old disease, in others congenital malformation, which must have been present for years before military life began.

Strenuous times, such as we are now passing through, may well excuse mistakes in the examination of the millions of recruits who have been so rapidly thrown into the hurly-burly of Flanders and elsewhere. But even under these conditions the following case is probably unique :

A private in the Army Service Corps was knocked down by a lorry somewhere in France and was sent home to a war hospital somewhere in England. He had sustained a fractured pelvis, and in addition it was discovered that he had atrophy of the optic nerves of old standing, the sight of the right eye being 3/60 and of the left 4/60. He stated that he had never been able to read, and that at the age of three he had had his head crushed between an omnibus and the kerb, after which sight failed. When seven years old he was sent to a blind asylum in the Midlands. He remained there nine years, and learnt Braille, tuning, and carpentry. He left when he was sixteen years old, and became at first a travellers' assistant and then a cabinet-maker. When war broke out he tried to enlist, but was rejected four times in consequence of defective sight. On the fifth

occasion his sight was tested by a corporal, and as he could read the larger letters at about three metres he passed and was posted to the artillery. Nine months later, in February 1916, he was discharged in consequence of defective vision, but in the following November he was re-examined and passed for the artillery, but was transferred to the A.S.C. as a B2 man (labour abroad). He went to France in February 1917 and became an ammunition-bearer up to the fighting-line. On June 12 he was knocked down at night by a lorry which he did not see and his pelvis was fractured.

The training and feeding of this man put the country to an unnecessary expense, for he was obviously incapable *ab initio*. His lack of sight qualified him for admission to St. Dunstan's Hostel, but not for military service.

## Physiological and Professional Vision

In evaluating the damage which any structure has suffered, the question calling for an answer is, " What is the loss of function, and what is the value of that function from a wage-earning point of view ? " In the eye the function is sight. To what extent does any loss of it interfere with, and how will it affect, the working power of the individual as a mere machine ? Practical experience demonstrates that persons with inferior sight, not necessarily the result of injury, can do some kinds of work as well as those having perfect eyes, for these latter have a superfluity of sight. Eyes, consequently, can be graded according to the requirements of trades, some of which need 75 per cent. (V = 6/8) of full visual acuity ; others, less exacting, can be carried on with 50 per cent. (V = 6/12).

But in transmuting 75 per cent. into 6/8, and 50 per cent. into 6/12, it must be recognized that these fractions are not equivalents, but only approximate estimates of the scope of vision. It is impossible to formulate mathematically what is 3/4 or 1/2 of normal sight.

By physiological vision (P) we mean the amount of sight of an eye, as estimated by Snellen's Types. By professional vision (Pr) we mean the smallest amount of P which is necessary in order that a man may perform industrial work, and this amount will vary in accordance with the requirements of the trade. P may be diminished without affecting Pr so long as it does not decrease below the latter. If, then, full vision is not required for a trade, it follows that a certain amount of sight may be lost without producing industrial incapacity. The workman who with perfect sight loses 30 per cent. of vision, if he follows a trade requiring 75 per cent. of P has consequently only lost 5 per cent. of Pr ; and again, if his trade requires only 50 per cent. of P he has lost no Pr. The relationship of P to Pr has been schema-

tized by Groenouw in his well-known "barème" (ready reckoner), and it and similar gauges are in general use on the Continent.

A division of occupations is made according to the amount of Pr that is required in order to carry on the various industries effectively, and these are divided into three classes :

(1) Those trades needing ordinary sight.
(2) Those needing superior sight.
(3) Those needing maximal sight (visual professions).

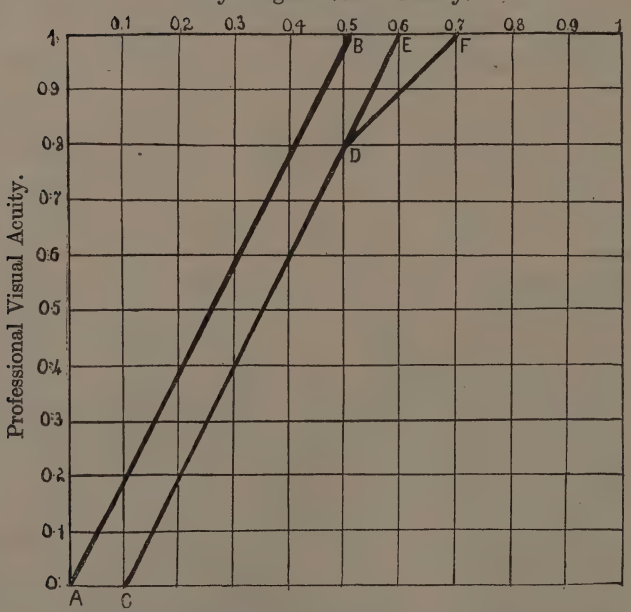
Magnus, however, would divide trades into two classes :

(1) V = 3/4 (6/8) for those trades requiring full industrial acuteness of vision.
(2) V = 1/2 (6/12) for those requiring a slighter degree of vision.

The explanation of Groenouw's barème is as follows (*vide* Table I) : Trades are represented by the oblique lines, AB (ordinary sight), CE (superior sight), and DF (maximal sight). The numbers on the horizontal lines mark in tenths the degree of P according to the European method of notation ; those on the vertical the degrees of professional visual acuity.

*Table I*

GROENOUW'S BARÈME




A, B.—Trades requiring ordinary visual acuity.
C, E.—Trades requiring superior visual acuity.
C, D, F.—Visual trades requiring maximal visual acuity.

The total loss of an eye is estimated at 25 per cent. ; and in partial loss each tenth of reduction of Pr would correspond with a tenth of 25, i.e. 2·50 per cent. of incapacity.

Let us now suppose that a workman has P = 0·4 and it is required to find out what is his Pr. We look for 0·4 on the horizontal line and follow down the vertical line until it intersects the oblique. At this point it is crossed by the horizontal line 0·8, which figure is the Pr of the workman.

If we examine another man requiring "superior" visual acuity we proceed in a similar way. A mechanic, for instance, with P = 0·6 has Pr = 0·9.

### *Approximate Barème, with Snellen's Optotypi*

The difficulty in dealing with Groenouw's barème from the British point of view is that which is inherent to a system of reckoning in which both percentages and duodecimals are dealt with. An approximate attempt may be made by replacing the decimal notation of P by Snellen's types (Table II). Converting the scale of P in both the decimal notation and in Snellen's into vulgar fractions and reducing them to a common denominator, we get the following result :

*Table II*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Decimal . . . | 0·1 | 0·2 | 0·3 | 0·4 | 0·5 | 0·6 | | |
| corresponding to . | $\frac{6}{60}$ | $\frac{12}{60}$ | $\frac{18}{60}$ | $\frac{24}{60}$ | $\frac{30}{60}$ | $\frac{36}{60}$ | $= \frac{126}{60}$ | Difference |
| Snellen's . . . | $\frac{6}{60}$ | $\frac{6}{36}$ | $\frac{6}{24}$ | $\frac{6}{18}$ | $\frac{6}{12}$ | $\frac{6}{9}$ | | $\frac{1}{12}$ |
| corresponding to . | $\frac{6}{60}$ | $\frac{10}{60}$ | $\frac{15}{60}$ | $\frac{20}{60}$ | $\frac{30}{60}$ | $\frac{40}{60}$ | $= \frac{121}{60}$ | |

It will be seen that on two occasions the fractions are identical, three times the decimal system is the higher, and once Snellen's. The total difference is 5/60 (1/12)—that is, the decimal notation (126/60) is higher than Snellen's (121/60) by 1/12.

Popular as the barème seems to be on the Continent, nevertheless for practical purposes it is unnecessarily complicated, not to say clumsy, as a means to evaluation, and a ready reckoner may be simplified on the lines of the wages tables in a housekeeper's book.

| P | Pr Class I. | Pr Class II. | Pr Class III. |
|---|---|---|---|
| 0·1 | 0·2 | — | — |
| 0·2 | 0·4 | 0·2 | — |
| 0·3 | 0·6 | 0·4 | 0·4 |
| 0·4 | 0·8 | 0·6 | 0·6 |
| 0·5 | — | 0·8 | 0·8 |
| 0·6 | — | — | 0·9 |

*Suggested Ready Reckoner arranged for Snellen's Type*

| Physiological vision. | Ordinary sight, Class I. | Superior sight, Class II. | Maximal sight, Class III. |
|---|---|---|---|
| | Professional Capacity. | | |
| 6/60 | 1/6 | — | — |
| 6/36 | 1/3 | 1/6 | — |
| 6/24 | 2/3 | 1/3 | 1/3 |
| 6/18 | 1 | 2/3 | 2/3 |
| 6/12 | — | 1 | 1 |
| 6/9 | — | — | 1 |

*Table showing loss of Pr resulting from loss of P (and corresponding with the amount of pension)*

| Physiological vision. | Ordinary sight, Class I. | Superior sight, Class II. | Maximal sight, Class III. |
|---|---|---|---|
| | Professional Incapacity. | | |
| 6/60 | 5/6 | — | — |
| 6/36 | 2/3 | 5/6 | — |
| 6/24 | 1/3 | 2/3 | 2/3 |
| 6/18 | — | 1/3 | 1/3 |
| 6/12 | — | — | — |
| 6/9 | — | — | — |

In other words, taking 25 per cent. to be the evaluation of total loss of one eye for ordinary vision, the other one having sufficient sight :

4/5 would be 20 per cent.
2/3 „ 17 „
1/2 „ 12·5 „
1/3 „ 8·3 „

Taking 33 per cent. to be the evaluation of the total loss of one eye for superior vision :

5/6 would be 27·5 per cent.
2/3 „ 22 „
1/2 „ 16 5 „
1/5 „ 6·6 „

When vision has fallen below 0·1 (6/60) it is practically impossible to continue a trade, and in allocating the pension V = 0. Walking can be accomplished, and fingers can be counted at a distance of 12 metres, provided vision is not less than 6/60 ; good type can be read at 10 cm.

One eye being healthy and the vision of the other reduced

to 6/60, the incapacity may be considered to be 25 per cent. for trades requiring ordinary visual acuity, and 33 per cent. for trades which need superior visual acuity; an additional 5 per cent. should be added if there is great facial disfigurement.

Neither in France nor in Germany is any pension allowed to workers in Class I unless vision is less than 0·5 (6/12).

According to Silex, workers in Class I require less than P = 2/3 in one eye and 1/3 in the other; Class II, 2/3 in one eye and 1/3 in the other; Class III, 2/3 in each eye. The following is a list of occupations arranged in the above classes:

*Class I.*—Basket-makers, binders, caretakers, confectioners, domestic servants, doorkeepers, dyers, farmers, florists, gilders, glass-blowers, grinders, labourers, masseurs, millers, packers, papermakers, polishers, porters, shoeing-smiths, soap-boilers, tanners, umbrella-makers, washerwomen.

*Class II.*—Blacksmiths, bootmakers, brewers, butchers, clerks, coachbuilders, cooks, coopers, cutlers, drapers, dressmakers, electricians, furriers, gardeners, glaziers, glovers, miners, musicians, tinsmiths, trussmakers, turners, weavers.

*Class III.*—Chauffeurs, diamond-polishers, embroiderers, engravers, gunsmiths, jewellers, joiners, lithographers, locksmiths, masons, mechanics, opticians, painters, photographers, plasterers, printers, railway servants (engaged in the movement of trains), sailors, sculptors, shipbuilders, slaters, telegraphists, watchmakers.

This classification can only be taken as a nominal estimate. There are many workers following the occupations in Class III, and doing the work more or less well, who have not the required standard of vision.

The German barème (Table p. 593) for the evaluation for one or both eyes is used in the following way: let us suppose that the P of one eye is 1/10 (6/60), and of the other 1/20 (3/60). We seek 1/10 in the vertical columns and, following it down till we reach the horizontal line corresponding with 1/20, we read 95, which is the percentage of incapacity for the two eyes.

Objection to this barème has been raised by Chavernac on the ground that it is not regularly progressive.

*Barème used in Germany*

| The physiological acuity of other eye. | The physiological acuity of one eye. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1–⅔ | 1/2 | 1/3 | 1/4 | 1/5 | 1/7 | 1/10 | 1/15 | 1/20 | 0 |
| 1–⅔ | 0 | 0 | 5 | 10 | 10 | 15 | 15 | 20 | 20 | 25 |
| 1/2 | 0 | 5 | 10 | 10 | 15 | 20 | 25 | 25 | 30 | 35 |
| 1/3 | 5 | 10 | 25 | 25 | 30 | 30 | 30 | 40 | 45 | 55 |
| 1/4 | 10 | 10 | 25 | 40 | 40 | 45 | 50 | 55 | 60 | 65 |
| 1/5 | 10 | 15 | 30 | 40 | 55 | 60 | 65 | 70 | 75 | 80 |
| 1/7 | 15 | 20 | 30 | 45 | 60 | 70 | 75 | 80 | 85 | 90 |
| 1/10 | 15 | 25 | 35 | 50 | 65 | 75 | 85 | 90 | 95 | 105 |
| 1/15 | 20 | 25 | 40 | 55 | 70 | 80 | 90 | 95 | 100 | 115 |
| 1/20 | 20 | 30 | 45 | 60 | 75 | 85 | 95 | 100 | 110 | 125 |
| 0 | 25 | 35 | 55 | 65 | 80 | 90 | 105 | 115 | 125 | 125 |

*Menacho's Barème*

| | | Diminution of capacity to work caused by ocular injuries. | Industrial value of the workman. |
|---|---|---|---|
| Work requiring good vision. | One eye normal . . . | 75 per cent. | 80 per cent. |
| | The other with V = 0·05–0·20 . | 5 „ | |
| | One eye normal . . . | 75 „ | 90 „ |
| | The other with V = 0·20–0·50 . | 15 „ | |
| | One eye normal . . . | 60 „ | 100 „ |
| | The other with V = 0·50–0·90 . | 40 „ | |
| Coarser work. | One eye V = 0·70–1 . . | 65 „ | 85 „ |
| | The other = 0·05–0·10 . . | 20 „ | |
| | One eye V = 0·70–1 . . | 60 „ | 95 „ |
| | The other = 0·10–0·50 . . | 35 „ | |
| | One eye V = 0·70–1 . . | 50 „ | 100 „ |
| | The other = 0·50–1 . . | 50 „ | |

*Ready Reckoner of Magnus and Groenouw on Professional and Physiological Vision*

| Scientific visual acuity. | Professional vision in employments with optical requirements. | | | | |
|---|---|---|---|---|---|
| | Superior. | | Inferior. | | |
| | Groenouw. | Magnus. | Groenouw. | | Magnus. |
| 1–0·75 | 1·0 | 1 | | | |
| 0·70 | 1·0 | 0·96166 | | | |
| 0·60 | 1·0–0·9 | 0·750 | 1·0 | 1·0 | 1·0 |
| 0·50 | 0·8 | 0·5833 | | | |
| 0·40 | 0·6 | 0·4166 | 0·8 | 0·79 | 0·7777 |
| 0·30 | 0·4 | 0·250 | 0·6 | 0·58 | 0·5555 |
| 0·20 | 0·2 | 0·0833 | 0·4 | 0·38 | 0·3333 |
| 0·15 | 0·1 | 0 | 0·3 | 0·27 | 0·2222 |
| 0·10 | 0 | 0 | 0·2 | 0·17 | 0·1111 |
| 0·05 | 0 | 0 | 0·1 | 0·06 | 0 |
| 0·02–0·00 | 0 | 0 | 0 | 0 | 0 |

## Tables of Groenouw, Caillaud, Schröter, and Magnus, indicating the Rates of Incapacity in Cases of Loss of Central Vision in Both Eyes and Loss of Peripheral Vision

### *Tables of Groenouw*

I. Amount of reduction of industrial capacity per cent. in round numbers in cases of diminution of visual acuity of both eyes, for trades with high visual acuity.

| Degree of scientific visual acuity. | | Peripheral vision is preserved. | | | | | | With total loss of central and peripheral vision of one eye. |
|---|---|---|---|---|---|---|---|---|
| | | 1·0–0·6 | 0·5 | 0·4 | 0·3 | 0·2 | 0·1 or less. | |
| Peripheral vision is preserved. | 1·0–0·6 | — | — | 5–10 | 10–15 | 10–20 | 10–25 | 20–33 |
| | 0·5 | — | 20 | 25 | 25–30 | 30–35 | 30–40 | 35–45 |
| | 0·4 | 5–10 | 25 | 40 | 40–45 | 45–50 | 50–55 | 50–60 |
| | 0·3 | 10–15 | 25–30 | 40–45 | 60 | 60–65 | 65–70 | 70–75 |
| | 0·2 | 10–20 | 30–35 | 45–50 | 60–65 | 80 | 80–85 | 85–90 |
| | 0·1 or less. | 10–25 | 30–40 | 50–55 | 65–70 | 80–85 | 100 | 100 |
| With total loss of central and peripheral vision of one eye. | | 20–33 | 35–45 | 50–60 | 70–75 | 85–90 | 100 | 100 |

II. Amount of reduction of industrial capacity per cent. in round numbers in cases of diminution of visual acuity of both eyes for trades with less visual acuity.

| Degree of scientific visual acuity. | | Peripheral vision is preserved. | | | | | | | With total loss of central and peripheral vision of one eye. |
|---|---|---|---|---|---|---|---|---|---|
| | | 1·0–0·5 | 0·4 | 0·3 | 0·2 | 0·1 | 0·05 | 0·02 or less. | |
| Peripheral vision is preserved. | 1·0–0·5 | — | — | 5–10 | 10–15 | 10–20 | 10–20 | 10–25 | 20–33·3 |
| | 0·4 | — | 20 | 25 | 25–30 | 30–35 | 30–40 | 30–40 | 40–50 |
| | 0·3 | 5–10 | 25 | 40 | 45–50 | 50 | 50–55 | 50–55 | 55–60 |
| | 0·2 | 10–15 | 25–30 | 45–50 | 60 | 65 | 65–70 | 65–70 | 70–75 |
| | 0·1 | 10–20 | 30–35 | 50 | 65 | 80 | 85 | 85 | 85–90 |
| | 0·05 | 10–20 | 30–40 | 50–55 | 65–70 | 85 | 90 | 95 | 95 |
| | 0·02 or less. | 10–25 | 30–40 | 50–55 | 65–70 | 85 | 95 | 100 | 100 |
| With total loss of central and peripheral vision of one eye. | | 20–33·3 | 40–50 | 55–60 | 70–75 | 85–90 | 95 | 100 | 100 |

*Table of Caillaud*

| Incapacity calculated according to diminution of visual acuity. | | | |
|---|---|---|---|
| I<br>With or without correction. The sound eye with professional visual acuity. The damaged eye had before the accident V = 1, and after the accident V. | | II<br>1. Acuity of the damaged eye no longer allows the same work.<br>2. Both eyes are wounded. Consider the incapacity due to diminution of acuity of each eye as in Column I. | III<br>The unwounded eye is blind. The wounded eye has a diminution of vision |
| Trade with superior visual acuity. | Trade with inferior visual acuity. | | |
| 0·8 = 1–10 %<br>0·7 = 10–15 %<br>0·6 = 10–15 %<br>0·5 = 15–20 %<br>0·4 = 20 %<br>0·3 = 20–25 %<br>0·2 = 20–25 %<br>0·1 = 25–33 %<br>below 33 % | 0·8 = 1– 5 %<br>0·7 = 5– 7 %<br>0·6 = 7– 8 %<br>0·5 = 8–10 %<br>0·4 = 10–12 %<br>0·3 = 12–15 %<br>0·2 = 15–20 %<br>0·1 = 20–25 %<br>below 25–33 % | Add the incapacity corresponding to the acuity of each eye.<br>Below 0·4 acuity of the only healthy eye add as before and add if the healthy eye has<br>V = 0·4 : 5–10 %<br>V = 0·3 : 10–15 %<br>V = 0·2 : 15–20 %<br>V = 0·1 : 20–25 %<br>below 20–25 % | Multiply by 4 the coefficient of incapacity accorded through the loss undergone for the visual acuity of the wounded eye as in Column I.<br>Example : for trades with inferior acuity, if the bad eye has<br>V = 0·4 : 40–48 %<br>V = 0·3 : 48–60 %<br>V = 0·2 : 60–80 %<br>V = 0·1 : 80–100 %<br>below 100 % |

*Professional Capacity in the various Forms of Disorders of the Visual Field with Professional Visual Acuity preserved*

| | Professional capacity per cent. | | | Reduction of industrial capacity. | | |
|---|---|---|---|---|---|---|
| | Magnus. | Schröter. | Groenouw. | Magnus. | Schröter. | Groenouw. |
| 1. Absence of the nasal half of one or both visual fields. Slight concentric contraction of one or both visual fields (less than 15°). | 100 | 100 | 100 | — | — | — |
| 2. Absence of the temporal half or all the visual field of one eye. Contraction of the visual field of one eye on the temporal side up to 60°. | 90 | 90 | 90 | 10 | 10 | 10 |
| 3. Absence of both temporal halves of the two visual fields. Concentric contraction of the two visual fields on the temporal side up to 60°. | 80 | 80 | 80 | 20 | 20 | 20 |
| 4. Absence of the two right halves of the visual field. Absence of the two left halves, of the lower half, or of the superior half. | 68 | 55–70 | 60 | 32 | 45 | 40 |
| 5. Concentric contraction of the two visual fields up to 30°. | 55 | — | 50 | 45 | — | 50 |
| 6. Concentric contraction of the two visual fields up to 5° at least. | — | 25 and less. | — | 100 | 75 and more. | 100 |

The use of a barème is a very simple way of awarding pensions for visual incapacity ; it is, indeed, as easy as turning over the leaves of a store list. But eyes are not pounds of tea nor yards of calico, and the assessment for the loss of an eye and a half is not a rigid sum. The evaluation of sight requires the careful consideration of the personal equation of the individual with regard to general health and strength, congenital aptitude, mental faculties, and capacity for re-education. The visual components must be analysed as well as tabulated. Is the sight central, peripheral, or both ? In addition to form, is colour sense affected ? Are judgment of distance and recognition of relief intact ? And if not, is the man young enough to recover to some extent these important aids to capacity ? Is accommodation present or absent ? Has he the inclination to learn a new trade, or is he too old to succeed if he make the attempt ?

## CHAPTER XXVI

## SCARS OF OCULAR STRUCTURES

### Fractures of the Orbit

He jests at scars that never felt a wound.

*Fractures of the Orbit* by projectiles of war are almost always the result of direct injuries; it is seldom that they are associated by radiation with fractures of the base, or due to contre-coup.

The character of the warfare may be surmised by the nature of the orbital fracture, for the direct injuries in shell-fire suggest trench fighting, whereas bullet wounds are more commonly seen in open battle.

Indirect fractures of the *roof* of the orbit are caused by falls or blows on the vertex or in the neighbourhood of the orbit; by gunshot wounds of the forehead; or by blows on the superciliary arch, etc. Such fractures of the roof may produce immediate death by rupture of the large vessels, or it may follow within the first week by meningo-encephalitis. Caution in probing wounds is necessary lest infection should be carried from the orbit to the cranium. They require treatment in an isolation ward, for any excitement may be followed by serious symptoms. It is unfortunate that radiography gives no help in the diagnosis of fractures of the roof of the orbit. Serious as injuries of the walls are, yet they are not so fatal as fractures of the cranium. The war has demonstrated how satisfactorily many of the patients progress towards recovery after the most dangerous orbital fractures, but it must not be forgotten that those of us who only see cases which are well enough to be brought home are likely to form a more favourable opinion than that of others whose experience is gathered at the front. A patient recently seen had a hernia cerebri through a fracture in the roof of the orbit, and the eye and superciliary arch were destroyed, leaving a yawning chasm. There was ocular paralysis of the opposite side, probably subjective, and he had passed through an attack of tetanus. Finally his general health was completely re-established.

Fractures of the orbit in the neighbourhood of the sphenoidal fissure and optic foramen may cause injury to the optic or to the

sensory or motor nerves. Concussion accidents of the macular region and choroidal rupture may also be produced at the same time with or without the eyeball having been touched by the foreign body. These concussion injuries, moreover, may result from wounds of the face distant from the orbit.

*Assessment.*—In evaluating these cases we are guided by the final result. The mere fact of an orbital fracture has no valency unless pathological results, such as the loss of an eye, paralysis or disfigurement, etc., are also present. It may be that the only sequela is a loss of sensation from injury of the supraorbital, or infraorbital, nerve : a paresis which may be unnoticed by the patient.

## Scars of the Globe of the Eye

*Rupture* occurs when pressure exceeds the elasticity of the eye, and is generally situated in the front part a few millimetres from the limbus of the cornea. It is only very exceptionally that it takes place in the posterior polar or equatorial regions.

Usually the eye is lost, and if the rent is extensive and there has been an excessive loss of vitreous, of iris, and of retina, or if the lens is dislocated out of the eye, it is advisable to enucleate early. But in some cases, especially when the conjunctiva is not torn, a conservative course is justifiable with the hope that the eye, and with it some amount of sight, may be retained.

Other injuries of the globe may be divided into *perforating* and *contused*, of which perforating are usually the more severe. In each the damage may be confined to the place of contact, or it may be more generalized. Tangential injuries, in which a glancing shot has passed on to be lost, it may be in the orbital apex, are especially liable to be attended by local effects only—to the choroid and to the retina.

Sometimes when the face has been involved in the contusion of the eye there is considerable loss of sight with a central scotoma, although there is no visible macular lesion. These symptoms lacking the support of objective evidence are likely to suggest malingering, especially if the examination is curt.

Punctured wounds of the sclera, particularly in the ciliary region, should not be evaluated until at least two months after the wound was received. Premature prognosis is to be deprecated, and as long as there is danger of sympathetic disease in the other eye the case must be kept under observation.

Small foreign bodies cause destruction of an eye in war wounds more often than large ones.

*Enophthalmos* is the displacement of the eye backwards in the

orbit, and is usually not observed for a few days if it is the result of a blow. It is more commonly seen in the young and the old than in adults, and may disappear spontaneously.

*Factors in Evaluation.*—As enophthalmos may be idiopathic as well as traumatic, it is necessary to inquire into the origin. When idiopathic it is seen associated with facial atrophy, and also with wasting diseases. The traumatic form may be one of the results of a severe blow on the eye, and in such a case it suggests the probability of fracture of the orbital bones (especially those of the floor) involving the antrum; although usually an immediate symptom it may appear later, and then is more often due to paralysis of the sympathetic, or the contraction of scars in the orbit.

Traumatic enophthalmos sometimes occurs without any evidence of fracture. Sight may be unaffected or, on the other hand, blindness may result. Two cases have been seen at the Bath War Hospital. The soldiers had been "buried," but in each there were no other symptoms and vision was 6/6.

Lagrange summarizes the causes of enophthalmos as follows:

(1) When the means of suspension, passive or active, of the eye are torn or paralysed; the capsule of Tenon ruptured; the oblique muscles paralysed; or when the recti muscles are retracted.

(2) When the cervical sympathetic is paralysed by too long action or excitation.

(3) When after a profuse hæmorrhage of the orbit or chronic inflammation of the cellulo-adipose tissue there occurs cicatricial contraction of the retro-bulbar tissue.

(4) When trophic troubles occur, involving absorption of the cellulo-adipose tissue.

(5) When the orbital cavity is enlarged by a fracture which produces a depression of any one of its walls.

*Assessment.*—Enophthalmos, *per se*, is of no importance, but if vision is affected the evaluation will be guided by the loss.

*Exophthalmos*, when traumatic, is very commonly pulsating. It is due to an arterio-venous aneurism formed by a rupture which has involved contiguous walls between the internal carotid and the cavernous sinus. But exophthalmos may be produced by an aneurism which is not traumatic, or by an erectile tumour, and in both the same pulsation will be transmitted. Neither need the lesion be in the orbit, for a similar clinical condition will accompany an aneurism of the ophthalmic artery within the skull.

*Factors in Evaluation.*—In reviewing a case said to be traumatic, our first inquiry should be directed to the nature of the

injury, and we should consider whether it was sufficient to produce a fracture of the base. In idiopathic, as in traumatic, exophthalmos, the onset is usually sudden. Let us suppose that a man has a fall from a horse and is picked up insensible some hours later, and that it is found that he has a *bruit* in the orbit. In such a case the problem before us is to decide whether the aneurism is due to the fall or the fall to the aneurism. In other words, was the aneurism traumatic or idiopathic ?—a very important point in some insurance cases. Before an evaluation of a case of pulsating exophthalmos can be made, the probability of cure or amelioration by digital compression or ligation of the carotid will have to be presented to the patient, and the risks and chances of success fully explained. While we are justified in holding out a strong probability of cure we cannot absolutely guarantee it, and the patient has the final word. Should he decline interference, and if we consider that he is unreasonable in doing so, although we cannot compel him to take the best chance of saving his life, we can advise, in the interest of himself and his family, that his pension be not made permanent. He may later on change his mind and undergo a successful operation in which any loss of vision may be completely regained. But even if no operation is done, there is always the possibility of a spontaneous cure.

Traumatic pulsating exophthalmos is of such momentous gravity that as long as it lasts the patient is quite unfit for work.

*False Imputation.*—It is conceivable that congenital pulsating angioma of the orbit may be ascribed to trauma. The history should be sufficient to prevent fraud in most cases. But with soldiers, away from the home of their youth, strangers among strangers, an exaggeration of some slight injury to the eye may readily deceive the unwary.

## Scars of the Eyelids

These are frequently disfiguring, impossible to conceal, and notoriously dangerous. The coadaptation of lid to lid in closing the eye is essential for the protection of the cornea. Consequently some form of plastic operation may be called for. Scar tissue is not normal tissue, and it is common knowledge that operations in the case of the former do not give as good results as those on healthy tissue.

*Coloboma* is a notch in the lid which may be congenital or traumatic. It does not interfere with sight unless of unusual size, in which case the cornea will be exposed to aerial enemies of varied description. It can usually be treated by operation

with very satisfactory result. There is usually no difficulty in distinguishing between the congenital and traumatic forms, and mistakes are not likely to occur.

*Ankyloblepharon* is an adhesion of the lids to each other, causing an obstruction to sight, and, when complete, vision is totally suspended. Operation for its release is not infrequently followed by relapse. An incomplete ankyloblepharon causes partial suspension of sight and is more amenable to treatment by operation.

*Assessment.*—Ankyloblepharon, when complete in one eye, causes a disability which is equal to the loss of an eye; lesser degrees, 5 or 10 per cent. Double ankyloblepharon is evaluated as blindness.

*Ptosis* (inability to raise the upper lid), like ankyloblepharon, causes closure of the lids, but differs from it by the absence of fixity, the lid can be raised by the finger. It is often incomplete, in which case the lid is ajar, enabling the eye to be of some service, but sight is confined to the lower part of the field of vision. The loss of the upper part of the field makes the incapacity absolute for workmen who use ladders, and for others who have to look upwards. Some compensation may be gained by throwing back the head, but the constant strain of such a position soon fatigues the occipital muscles. Operation in these cases fortunately holds out good hope of permanent benefit.

*Assessment* is governed by the necessities of the occupation, and is estimated in the French "Guide Barème" at from 5 to 10 per cent. for one eye, and from 20 to 100 per cent. for both, but a reduction follows a successful operation.

The consideration of these cases when operation is refused presents great difficulty, for total ptosis means total incapacity. When relief is declined in so simple a case a permanent irreducible pension on the above scale is a scandal, and should be met by a low grade award.

*Ectropion* (eversion of the lids) results as a sequela of scars on the outer surface of the lids, and in many cases produces much disfigurement.

When a scar of the upper lid is attached to the roof of the orbit the ectropion is likely to be especially obnoxious, and is difficult to remedy. Sometimes the original wound has notched the lid, producing a coloboma, and a plastic operation for this will be called for before a final assessment can be made.

Tenderness of a scar of the lids is not usually complained of, and neuroma is seldom seen.

*Assessment.*—In the Austrian tariff, scars causing ectropion are evaluated at 15 to 25 per cent. These figures are certainly not too

high considering the frequent lifelong discomfort produced by the exposure of the cornea. In many cases finality is not reached until comfort is obtained by the loss of the eye. The æsthetic appearance demands the utmost consideration, for the repugnant deformity which is sometimes seen unequivocally lowers the sufferer's economic value in the labour market. A blemish which cannot be hidden entitles a man to an evaluation more liberal than is called for in cases of scars on parts of the body which are usually clothed. In the case of a young unmarried woman her loss in the marriage market must not be overlooked. Nor would she be employed as a waitress, nursemaid, or shop assistant.

The French, who are chary of recognizing æsthetic considerations, suggest 1 to 5 per cent. when one eye is affected, and 5 to 10 per cent. for both. In ectropion, as in all scars of the eye and lids, an additional grant must be made if there is also a depreciation of visual acuity.

*Lagophthalmos* (inability to close the lids) causes serious discomfort and danger from the exposure of the cornea to attacks by dust and septic matter, resulting in ulceration. The drying of the cornea also often initiates a degenerative change known as xerosis.

The usual cause of lagophthalmos is contraction of scars of the upper lid, but it may also be due to paralysis of the orbicularis. It may be relieved or cured by plastic operation, utilizing a flap of skin from the forehead or from the face, whichever site is free from scar-tissue. In case of permanent paralysis of the orbicularis but little can be done. The lids may be brought together by sutures, a method which while it prevents the access of foreign bodies, yet at the same time occludes sight. Should both eyes be affected it is probable that eventually sight will be totally lost.

*Assessment.*—The seriousness of the condition is very great for those whose work is either out of doors or in a shed or factory permeated with dust, fluff, or smoke.

For mild cases, in which one eye only is affected, 15 to 20 per cent. is a fair evaluation; for those who are exposed to the special dangers alluded to, up to 25 per cent. or more, according to the visual depreciation, with an added bonus of 15 per cent. Lagophthalmos of both eyes, from 30 to 60 per cent. is allotted in France, and this seems a reasonable evaluation.

*Entropion* (incurving of an eyelid).—If a scar is situated on the inner side of either lid danger is to be apprehended from the inturned lashes (*trichiasis*) brushing against the cornea. Disasters follow—infective ulceration, corneal abscesses, and loss of sight.

*Assessment* for entropion of one eye may be estimated at from

5 to 15 per cent., but it is probable that a greater loss of sight will have to be reckoned with later on, and that a revision on an upward grade will be called for from time to time. When both eyes are affected by entropion the evaluation will range from 15 to 50 per cent.

Scars of the *lachrymal* canals cause *epiphora*. The tears no longer pass down the nasal duct, but accumulate in the cul-de-sac of the lower lid and overflow on the cheek, irritating the skin and causing eczema. Wind and rain augment the discomfort, dust and smoke increase the flow.

Both ectropion and entropion may displace the puncta, and the constant " watering of the eyes " is a serious menace to every kind of work. The accumulated tears interfere with sight and require the perpetual use of the pocket-handkerchief. Apparently a minor disability, yet it plays havoc with the mechanic, with railway servants, and others exposed to wind and cold, and obliges them to change their occupation to an indoor one. Ectropion and entropion are not only a frequent cause, but also may be the result of, epiphora.

In war wounds one sometimes finds that the lachrymal gland has been shot away, and then the complaint is of absence of tears, and results in xerosis of the cornea.

*An assessment* of from 10 to 20 per cent. is called for in epiphora, according to the circumstances of the case and the occupation of the pensioner if both eyes are affected. If only one eye is affected, from 1 to 10 per cent.

*Scars of the Conjunctiva* may be induced by burns or other injuries, more especially by lime and escharotics generally. Soldiers suffering from conjunctival scars are not infrequently seen at war hospitals, the cause being trachoma. In any of these cases there may be a contraction of the commissure (blepharo-phimosis), ankyloblepharon, or a symblepharon (adhesion of a lid to the globe of the eye). Interference with the mobility of the eye, as well as with its visual function, are generally present, and epiphora adds its share to the disqualification for work.

*Pterygium* is one of the results of irritation of the conjunctiva, and occurs after burns and scalds, or following prolonged exposure to dust. It is situated most usually on the nasal side of the cornea, but sometimes on the temporal, occasionally it may be on both sides. When in other situations it is not a true pterygium and rarely causes much inconvenience.

*Assessment* of conjunctival scars is based upon loss of sight. Caillaud suggests from 1 to 5 per cent. for conjunctival xerosis. In symblepharon the incapacity may be from 0 to 15 per cent. for

one eye, and from 5 to 25 per cent. for both. In cases of pterygium no importance attaches when it does not extend beyond the periphery of the cornea, but if it has advanced sufficiently to interfere with sight evaluation depends upon the amount of loss of visual capacity.

### Scars of the Cornea

are known by different names according to the density of the infiltration :

(1) *Maculæ* (or *Nebulæ*), the result of ulceration and infiltration ; (2) *Leucomata*, when they are distinctly white ; (3) *Sclerosis* is the term applied when the nebulæ are very dense. They may be due to wounds, scalds, burns, and other injuries, and they are apt to result in a double disability. Sight may be rendered less perfect, in the first place, by astigmatism from unequal contraction of the wound in healing ; and, secondly, by the opacity. If the opacity is nothing worse than a nebula, however hopeless the appearance may be during the acute stage, it not infrequently happens that very considerable amelioration of sight occurs later on. If, on the other hand, a leucoma has formed, but slight hope of restitution can be promised, and still less if nystagmic movements of the globe have supervened.

A convenient way of noting the position of the scar is to compare the cornea to the face of a watch. We can describe the site according to the figures marking the hours. The scar may be at twelve o'clock, four o'clock, and so on. A leucoma may be adherent to the iris (anterior synechia). In these cases the pupil is often deformed by being dragged in the direction of the corneal periphery.

An emmetropic eye scarred by nebulæ or marred by leucomata may eventually become myopic, or an eye that was originally myopic may become increasingly so to a dangerous extent. In the former case, too, an internal squint may develop, in the latter an external.

Loss of sight may be extreme when the scar is central or paracentral. Dissipation of light, which then occurs, produces a dazzling confusion when the patient tries to use the two eyes together, and he will frequently keep the injured one closed in order to prevent this annoyance.

But the noiseless foot of time treads out the furrowed cornea, the opacity clears to some extent and the blepharospasm ceases. Sooner or later we shall be called upon to decide whether the scar is likely to become absorbed, or whether it is so dense that little further can be hoped for in this direction. The age of the patient is an important item, for in adolescence and young adult

life anticipation of improvement is justifiable, but in older persons recuperation is slight.

*False Imputation.*—In the differentiation of traumatic scars from those produced in the cornea by disease, the key to the elucidation in the majority of cases is to be found by an examination of the other eye. If in that one there is a similar nebulous condition, and if at the same time no complaint is made that that eye was also injured, the theory of a traumatic origin in the first eye will require strong corroborative evidence before it can be accepted.

In scars from incised wounds there is a thickening of the edges, where Bowman's membrane has been entangled in the gap, and the site is plainly visible by a permanent linear fibrous cicatrix. This is not seen in nebulæ the result of non-traumatic keratitis. In perforating wounds the membranes of Bowman and of Descemet are never restored, but are replaced by fibrous tissue. In recent cases the retracted edges of Descemet's membrane may occasionally be seen; in others the scar may be cystoid from connexion with the aqueous chamber. Should the wound become suppurative and the eye have to be removed, a section will be indistinguishable from one in a case of purulent keratitis of non-traumatic origin. The penetration of the cornea caused by a foreign body may closely resemble a perforation resulting from an ulcer.

Should the iris have become entangled in a leucoma (anterior synechia) it is often quite impossible by the appearance to say whether it is due to a wound or to inflammatory non-traumatic disease.

A wound scar can be differentiated from one following interstitial or other form of keratitis, by its localization and sharp contours, whereas in these other forms the opacity is likely to be diffused, shading off into the surrounding cornea; the scars, too, may be multiple. Interstitial keratitis will probably proclaim itself in both eyes, and other stigmata of an inherited taint will manifest themselves in the facies, teeth, and elsewhere.

*In assessing Scars of the Cornea* we are guided by the loss of vision which has been sustained. If an iridectomy has been performed, an additional grant should be made of from 5 to 10 per cent.

An increase should also be made for adherent leucoma of one eye, from 0 to 5 per cent.; and of two eyes, 5 to 10 per cent.

Scars which do not interfere with function, if compensated for at all, should be by a gratuity rather than by a pension, unless the detriment, on æsthetic grounds, prevents or diminishes the

opportunity of getting employment, or affects in any way the full capacity to earn money.

## Scars of the Lens

*Cataract.*—The lens may be completely opaque, when professional capacity with that eye will be entirely annihilated. Absorption of cataractous opacity practically never occurs, and operative means alone can be relied upon to restore a modified function to the eye. But the opacity may be less complete, or confined to a part or parts of the lens, and useful function may be retained for many years. Localized opacities may even be absorbed.

A general concussion of the eye may injure the suspensory ligament, and so produce cataract although there is no external wound.

Or, again, cataract may follow a concussion even though there is neither rupture of the suspensory ligament nor perforating wound of the eye.

Difficulty may arise regarding the evaluation in consequence of the long interval which may elapse between the receipt of the injury and the onset of the cataract, as long as eight years in some cases, according to Gayet.

Total traumatic cataract follows fracture of the orbit in war wounds in 1·15 per cent. of the cases.

*Imputation*, not necessarily false, of a traumatic origin for a cataract is frequently met with in ophthalmic practice, and is the origin of demands for " damages " in civil life and of pension in injuries the result of war. Cataractous stigmata in the lens are so frequently to be found in men past middle life that it often happens that these senile changes are imputed to trauma.

Cataract is a painless disease, and in the incipient stage the slight blurring is unnoticed, for full vision, either for near or far work, is superfluous for most occupations. But if the attention is directed to the eyes by an injury, then an old-standing deficiency is likely to be discovered. Examination under a mydriatic discloses striæ at the periphery of the lens, and the question is mooted, " Are they traumatic ? " Comparing the injured eye with the uninjured one we find, perhaps, an identical condition. In each there is a halo of striæ, and the theory of trauma is rudely shaken. Peripheral striæ are not usual manifestations of trauma, more frequently we see opaque patches or diffused cloudiness.

*Senile Cataract* is practically always double, although not necessarily concurrent in origin. A moderately advanced cataract in one eye and quite clear lens in the other does not as a rule

signify a senile change, but distinctly supports a claim to a traumatic origin. If, on the other hand, there are degenerative changes in both lenses, even though less marked on the uninjured side, it is probable that both are senile.

In all cases in which cataract in each eye is present, the possibility of a double injury arises ; the injuries need not have occurred simultaneously, but one may have preceded the other, with a more or less long interval.

The signs of cataract are often not detected, sometimes cannot be, until months after the original putative cause, and our opinion must be founded on the nature of the injury, the presence or absence of striæ and localized opacities, and the comparative condition of the uninjured eye.

On the other hand, cataract caused by electricity comes on early, and is associated with other symptoms of " electrocution." It is very rare. The nature of the cataract may throw light on the ætiology, and we may find that the characteristics of the diseased lens are not those which are usually associated with a traumatic origin. We may discover, for instance, the well-known *zonular* appearance, and our suspicions are immediately aroused regarding a congenital cause. Confirmatory clues, familial and hereditary in other members of the family, may be met with. Our next step is to examine the evidence of the accident, and we may find that a traumatic cataract has been grafted on a zonular one. Zonular cataract is almost always a binocular disease ; we therefore compare the two eyes. Are the additional signs of injury present in one eye and absent in the other, or, on the other hand, are the appearances similar in both ?

In the next place, the cataract may be *axial*, when the difficulties of the problem are in some respects similar to those seen in zonular disease.

*Anterior Central Capsular Cataract* also is not traumatic, but a result usually of ophthalmia neonatorum.

In all three cases any augmentation of the cataract by trauma is a justification for a claim to compensation.

*A Posterior Polar Cataract* may be caused by air concussion from the bursting of a shell alone, without any particle touching the eye. In young men and women suffering from cataract, if there is doubt about an injury, the possibility of a *diabetic* origin must be excluded by examination of the urine. This form of cataract is also usually binocular.

*Refusal to undergo a reasonable operation* in eye disease may be considered in relation to cataract. What is the liability of the State to the soldier who has a cataract resulting from military service, and what is the responsibility of an employer or insurance

company to a workman who has sustained a similar casualty arising out of his employment, if they refuse to have the cataracts removed by operation? The danger from an anæsthetic does not happen, for chloroform is unnecessary. The operation is not painful, nor is it probable that untoward symptoms will follow; but, on the other hand, a good result with useful sight can almost certainly be promised. But by refusing operation the soldier is entitled to 50 per cent. (13s. 9d.) a week for life. The temptation is great. Unfortunately the British Pension Warrant does not make any mention of relative loss, which practically is the condition in these cases. A cataractous eye cannot be described as an absolutely lost one, unless there is no perception of light, for there is a potential reserve of sight which may be drawn upon by a successful operation. Until the result of operation is known, no permanent pension should be made, and if so reasonable a line of treatment is declined, a final award should be indefinitely postponed.

The loss of sight of both eyes by cataract, combined with a similar refusal of operation, is even more to be deplored, for a human being, who is also probably a mental degenerate, is thrown upon the world hopeless and helpless.

*Assessment of Cataracts* depends upon an estimation of the loss of professional visual capacity.

In cases in which a successful operation has been performed for cataract, from 5 to 20 per cent. for one eye; and from 10 to 40 per cent. for both.

*Aphakia* (absence of the lens) may be the result of operation or may be due to an injury. In the latter case it may be unsuspected. The writer recently saw a soldier who had been wounded by shrapnel in both eyes. The right was entirely destroyed, and with the left he had some difficulty in walking about alone, and he was pensioned accordingly. Nevertheless, with a lens of high degree he could read 6/6. His joy may be easier imagined than described.

The loss of the crystalline lens in one eye, the other one being sound, is practically the loss of the eye for professional purposes. A correcting lens cannot be worn because the images transmitted to the visual centres by the two eyes are so different that it is impossible for the brain to co-ordinate them. The value of an aphakic eye depends (1) on the fact that the field of vision prevents the injured man from colliding with obstacles on that side, and (2) it is a visual reserve in case of loss of the other eye. In such the aphakic organ, with the help of a suitable glass, may be extremely useful.

*Assessment of Aphakia* in one eye may be estimated at 20 per

cent. or less in the young, who can more readily acquire visual re-education. For trades requiring good visual acuity, 25 per cent; for trades requiring indifferent acuity, 12 to 15 per cent.; if both eyes are affected, 20 to 25 per cent.

*Luxations* of the lens (displacements) may be due to injuries or disease of the eyes. In myopia of high degree the blow need not be severe, and even violent sneezing will be sufficient to produce this very disastrous catastrophe. In war injuries we sometimes see dislocation of the lens, which is produced by aerial currents from the bursting of a bomb in the neighbourhood of a soldier.

A luxation may be into the vitreous, the most frequent, when detachment of the retina and other serious sequelæ may follow; into the anterior chamber, producing glaucoma, cyclitis, or sympathetic disease; under the conjunctiva, when in the young the lens may become absorbed, but will take some months; or the lens may be expelled from the eye altogether.

A total luxation causes immediate loss of professional sight, and in addition there is the constant fear of the onset of complications which will destroy the organ.

*Subluxation* is a partial displacement, and in examining a case we may observe a slight tilting of the lens; we may also observe when the patient moves his eyes a tremulousness of the pupil. The objective signs may be very slight, and there is also one important subjective symptom which the patient may not have noticed, and that is the loss of accommodation from inability of the ciliary muscle to act duly on the lens. The binocular patient is likely to be a monocular reader and writer.

Subluxation is not a very rare result of war injuries. It occurs in 0·32 per cent. of cases of fracture of the orbit.

Not infrequently in war wounds it happens that the subluxation remains quiet permanently, the lens does not become opaque, and no secondary mischief arises.

*Factors in Evaluation.*—Luxation into the vitreous, except for the aphakic disability, may cause little inconvenience to some workers. Sight is sufficient for avoiding collision on the injured side, and daily work in many capacities can be performed. The subject, however, is on the brink of disaster, and at any time a catastrophe may occur. Glaucomatous attacks may arise and subside, cycles of iritis may ensue and become arrested, and be succeeded by long periods of quiescence.

An equitable evaluation in such cases requires judgment and experience, for if a permanent assessment is made soon after the injury was received, when the eye is quiet, a moderate estimate may seem enough, but later on, when an acute stage arrives and

work is impossible, an increased *irreducible* pension is demanded and granted.

The possibility of a late successful operation is a factor which cannot be provided for in this or many other injuries by a hard and fast permanent pension scheme.

*False Imputation* in luxations of the lens.—A subluxation is not necessarily traumatic, for it may be congenital and due to a defective development of the suspensory ligament. The tremulous iris accompanying it (iridodonesis) is not very conspicuous until the eye is scrutinized, and the condition, therefore, is a latent reserve for fraud which has great possibilities. Generally, however, the congenital anomaly is not confined to one eye only, and it is, in addition, associated with an anterior chamber which is deeper than normal.

*Assessment of Luxations.*—When *complete*, luxations render the eye aphakic; but in *partial* displacements double sight, which is monocular, may occur because some rays of light pass through the aphakic pupil and others through the periphery of the luxated lens. In such the confusion of sight may be so annoying that the eye is useless. The evaluation then will be the same as for a monocular person. If the lens is entirely clear of the pupil a glass will be required both for near and for distant work—that is, a bi-focal one. Advantageous as the glass is, yet it will be found that rapidity and precision in performing skilled work are considerably reduced, and due allowance must be made in the evaluation for these defects.

*Paralysis of the Accommodation* may be caused by a contusion of the eyeball, and it is a very serious disability for those who follow professions which require binocular sight. Such people have become, for practical purposes, presbyopic in one eye only. They are unable to accommodate sight to different distances, and reading is frequently impossible. But for labourers and others not requiring near sight it may be of little consequence. Iridoplegia and cycloplegia are almost invariably permanent.

*Factors in Evaluation.*—The refraction and the age of the patient are two points which necessitate some attention. First, with regard to:

*The Refraction.*—The presence of myopia in one suffering from paralysis of the accommodation neutralizes to some extent the disadvantage, and he will be less inconvenienced than if he were hypermetropic. Secondly, *age* is a factor to be carefully considered. Its special importance is due to the circumstance that he who is approaching fifty years old has lost considerably less by the paralysis than he who is only twenty. In the first case we have to recompense the man of fifty for a natural change

which at his age was at least incipient; in the second case, the man of twenty, for the premature onset of the senile change nearly thirty years before it was due. Consequently in evaluating cases of traumatic paralysis of the accommodation we have to distil the word premature into its component years. An emmetropic workman of forty will have to wear glasses for close work, instead of waiting some five years for the normal onset of presbyopia, for that is the period by which trauma has forestalled nature. But it will frequently be the case that other muscles supplied by the third nerve are also paralysed and that it is a combined affliction for which we have to legislate. The pension will have to be based upon the number of muscles involved.

Prejudice against the use of spectacles by some employers is a factor which has more force in the case of the young than in the case of the middle-aged: the former are apt to be labelled blind, but worn by the latter glasses are thought to be evidences of experience and vouchers of venerability.

*Assessment of Paralysis of the Accommodation.*—For those who do not require to use both eyes in work, the disability is likely to be so slight that it may be fairly met on the basis of an incapacity ranging from 10 to 15 per cent. for one eye, and from 10 to 25 per cent. for both eyes. For trades requiring near vision, if one eye only is affected, 15 to 25 per cent.; in both, 25 per cent. For trades not requiring near vision, if one eye only is affected, 10 to 15 per cent.; both eyes, 20 per cent.

## Scars of the Iris

**Synechiæ.**—When the iris has become mortised to a corneal scar the condition is spoken of as an anterior synechia, but when a plastic exudation from the posterior surface of the iris glues this structure to the capsule of the lens we have the condition known as posterior synechia. The pupil is then unable to dilate, or if it does to any extent it will be seen that circularity is lost. The function of the pupil is interfered with, and variations in its size, caused by light and shade, serve only to drag on the lens and to produce discomfort. In traumatic iritis when the margin is entirely attached to the lens we have what is called *exclusion* of the pupil. The pupil itself is clear. On the other hand, when it is not clear, but filled with inflammatory exudation, the term *occlusion* of the pupil is applied. Exclusion and occlusion may occur together. It is necessary to have a clear conception of the difference when the future has to be forecast, for with *exclusion* we must anticipate—it may be soon, it may be late—a glaucomatous increase of the tension of the eye, with

the possibility of its total loss. With *occlusion* this risk is very much less.

*In Iritis* we must not be misled by the presence of a gumma, for one may develop in a genuine traumatic iritis in a patient who has a specific taint. A clear history of injury, confirmed by unimpeachable witnesses, is required before this theory can be accepted.

*Wounds of the Iris* are almost always associated with a corneal wound, and frequently with the lental capsule also. The injured iris is likely to prolapse and become entangled in the scar. A similar condition does not usually occur after the perforation of an ulcer of the cornea. Prolapse of the iris generally signifies that the foreign body has been comparatively large, that it has travelled at low speed, and that it has not been retained in the eye. The converse occurs in the case of a small body at great speed without prolapse.

*Mydriasis* (dilatation of the pupil).—The ease with which the pupil can be dilated by means of atropine, cocaine, etc., makes it essential that every case should be carefully investigated before deciding that the enlargement is the result of trauma.

Traumatic mydriasis is the result of paralysis of the sphincter of the pupil, and it may be accompanied by paralysis of the accommodation (traumatic cycloplegia). After an eye has become quiet from the result of an injury and the blood in the anterior chamber has become absorbed, if there is no diminution of the size of the pupil it is probable that the mydriasis will be permanent, but in a minority of the cases, even after a period of some months, recovery ensues. The uncertainty of the result is an important factor in the evaluation, and one which demands great caution in making a prognosis.

It will be seen, then, that in traumatic mydriasis interference with work may be little or much, depending (1) on the presence or absence of accommodative paralysis, and (2) on the requirements of the patient's work. In some there will be no disqualification, in others much.

Instead of mydriasis trauma of the iris may produce myosis, and this also may last long, even for months or years.

*Assessment* ranges from 0 to 15 per cent. for one eye, and from 5 to 20 per cent. for both.

*Iridodialysis* (rent in the periphery of the iris).—The iris is torn away from the ciliary body and a double pupil is formed. Practically it is permanent, and as it is often associated with lental and other complications, it is a serious disability in all classes of industry. A rent in the periphery is a less serious matter, and if small may heal without trouble, but if it is accom-

panied by much bleeding a week or two will be required for absorption.

*False Imputation.*—Injuries of the iris are occasionally mimicked by a congenital condition due to arrested development known as *irideremia* (absence of iris); and this may be falsely ascribed to accident.

Congenital iridodialysis also has a very similar appearance to the traumatic variety.

*Iritis*, the result of syphilis, gonorrhœa, or other infection, must also be borne in mind when the late effects of iritis, said to be caused by accident, are being reviewed.

*Coloboma of the Iris* is due to imperfect closing of the choroidal fissure during intra-uterine life. It may be falsely attributed to trauma or to a surgical operation following an accident or war wound, but an experienced examiner is not likely to be deceived. The appearance of the iris itself is often distinctive, and instead of a uniform pigmentation we find a variegated check pattern due to developmental defect of the mesodermal layer of the iris. In many cases the coloboma includes the ciliary body and the choroid, when the well-known appearance to which it gives rise at once excludes the theory of a traumatic or surgical origin.

In congenital coloboma the notch is almost always situated downwards, sometimes with a slight inclination inwards or outwards.

The probability of a coloboma being exploited as a means to obtain a pension may seem to be remote, but a case has occurred in the French army. A soldier who received multiple wounds from the splinters of a grenade claimed a retiring pension on the ground of a slight wound of the lower lid and a torn iris and choroid. There was no record of a wound of the ocular globe in any of the documents of his dossier, and the case was referred to a specialist, who reported that there was a small scar over the left lower lid. The eyeball presented a typical coloboma of the iris complicated by a large coloboma of the choroid. The ocular lesions were congenital and had no connexion with his wounds.

*Assessment* of scars of the iris, whether they are due to synechiæ or to iridodialysis, depends upon the depreciation of professional sight.

In the case of iridodialysis of one eye an addition of from 5 to 10 per cent. should be made; and in the case of both eyes, from 10 to 15 per cent.

### Opacities of the Vitreous

are detrimental to work in consequence of the production of muscæ volitantes. In the young, absorption of these opacities

may reduce the annoyance and inconvenience, but in the older they are likely to be permanent.

*Foreign Bodies* in the vitreous may become encapsuled, when the evaluation will depend upon the loss of sight.

*Contusions* may cause a hæmorrhage which will take six to eight weeks to absorb, and may then leave permanent opacities.

Hæmorrhage into the vitreous occurs in 5 per cent. of war fractures of the orbit.

## Scars of the Retina

In the early stages of wounds of the retina the ophthalmoscope will show, if the fundus is not hidden by bleeding, a circumscribed interstitial inflammation with exudates, and this later will be replaced by a localized, and possibly a blood-stained, scar. The site of entrance of a foreign body and its track through the sclera can probably be determined. If the case is simple, sight may be fairly good. But there are cases in which the damage is less localized, other structures involved, and in which the bleeding recurs again and again, and perhaps finds its way into the vitreous. In these hæmorrhagic traumatisms the final state may be that which is known as retinitis proliferans (including proliferating choroido-retinitis), a condition first observed by Mackenzie in 1864. Until the war taught us differently it has always been considered one of the rarer forms of intra-ocular disease. So exceptional is it that Schobl only saw three cases in twenty-six years among 120,000 ophthalmic patients. Notwithstanding this evidence of rarity, three cases were attended at the Bath War Hospital in the first 700 soldiers with eye complaints.

Lagrange states that proliferating choroido-retinitis occurs in 7·30 per cent. of cases of fracture of the orbit when this latter is due to war wounds. The clinical picture is not likely to be mistaken; in the fundus recently developed connective tissue, glistening and sharply defined, arrests our attention by its falciform shafts, over which, as they dip into the stagnant vitreous, new-born vessels ripple. The later stages are marked by pronounced choroidal pigmentation. But although retinitis proliferans is not likely to be confused with any other pathological condition, it may be falsely imputed to recent trauma when the origin is really old, and either traumatic or diathetic. The presence or absence of choroidal pigmentation is a valuable assistance in the estimate of age in these cases.

*Foreign Bodies in the Retina* can often be detected and their exact site located by means of the perimeter. The field of

vision may show a scotoma or a limitation in the extent of the field at the point of lodgment ; and this finding may be confirmed by tenderness of the globe at the same position.

*A radiograph* is another valuable indication of the presence of a foreign body, and by means of it doubt and dispute can often at once be silenced.

*Siderosis* (staining by metallic salts) is a late and persistent sign of a retained foreign body. It is often very marked in the iris, and it is a warning that the question of sympathetic disease is a more important one than the immediate evaluation of the injury.

*Detachment of the Retina*, when total, produces blindness, but when partial, even though the macula is included, there will be sufficient sight for orientation. Reattachment may occur, and more frequently happens than in non-traumatic cases.

*Rupture of the Retina* is usually fatal to sight.

*Œdema of the Retina* is one of the lesser evils, and usually subsides in a few days without causing permanent damage, unless the macular region is involved.

*False Imputation in Scars of the Retina.*—It will only be on very rare occasions that a question of false imputation occurs. The history of the case, together with the medical report of the condition of the eye at the time of the accident, will clear up doubt about the origin.

*Assessment of Retinal Hœmorrhage.*—Before this can be estimated it is necessary to survey the case in its entirety, for non-traumatic intra-ocular hæmorrhage is frequently only a symptom of some underlying disease, the prognosis of which is that of the local lesion.

*Age* is a factor which cannot be overlooked. In men of military age—or rather of what was formerly called military age, for an upward tendency is altering our conceptions—absorption may be rapid ; but in more advanced life, when there is stagnation of the vital processes and torpidity in renovation, function becomes permanently impaired. A small hæmorrhage, too, may be the precursor of a hæmorrhagic retinal deluge in which sight is entirely lost.

The non-traumatic causes of hæmorrhage may be :

(*a*) Increased pressure within the vessels.

(*b*) Decreased resistance of their walls.

(*c*) A combination of (*a*) and (*b*).

The fundamental origin is extra-ocular, and a wide survey of general disease may be required to elucidate the pathology of the *causa causans*. What does he know of ophthalmology who only ophthalmology knows ?

The hæmolysis may have a streptococcic origin in some unexpected lair ; or it may have a malarial ancestry. It may be hyperæmic, anæmic, or toxæmic. And upon its ætiology the evaluation will be based. When the final result is reached the permanent pension can be fixed, according to the amount of residual sight which has been salved.

## Scars of the Choroid

Lesions arising from rupture (which only exceptionally involve the retina) entail a very serious prognosis. The eye may have become quiet, but little or no sight is to be expected if the rupture is extensive or if it is near the macula lutea.

*Contusions* may produce choroidal bleeding, for the absorption of which twelve months will be required. Meanwhile sight may be very seriously affected. A request for a final opinion and evaluation in these cases should be refused until all active mischief has subsided.

In examining a case of choroidal hæmorrhage following a blow on the eye, a localized clot of blood will be seen, or, in other cases, the bleeding will be more diffused in the tissue. The site of the hæmorrhage is apt to be marked later on by an atrophic patch.

If, instead of a blow, the injury has been a perforating one, we may find a circumscribed choroiditis, in which also the retina will probably be included. Septic cases may result in hyperplastic choroido-retinitis having the characteristic appearance first described by Beer as "amaurotic cat's eye," and by Mackenzie as "traumatic cat's eye." Eventually the eye will be lost from phthisis bulbi.

*Disseminated Choroiditis* is unlikely to be mistaken for trauma. The discrete, more or less pigmented manifestations of that disease are too easily recognized, and they are also very likely to occur in both eyes.

When the site of the wound or blow is far removed from the macula the eye may be completely visually restored, and no need for an evaluation will be called for. If, however, there is loss of vision, or a scotoma in an important area, the damage is likely to be permanent.

*False Imputation* has not much scope in choroiditis ; nevertheless, the attempt has been made in France to obtain compensation in cases of recent trauma when the choroiditis was obviously of old standing.

Should the question of false imputation be raised in a case of ruptured choroid, a clue to the age of the injury will be found

in the scar itself ; for if recent, it will be a yellowish-white colour, but older ones show the very white sclera. Black choroidal deposits are late manifestations.

*Assessment.*—Amelioration in all forms of trauma of the choroid is slow, and evaluation, based on the residual vision, can seldom be estimated under twelve months.

Whether new or old the arc-shaped scars of rupture, the localized sclerosis of perforating wounds, and the more diffused choroidal changes from general concussion are likely to be permanent and to interfere with vision, more especially when situated at the site of the injury. In all of them a chronic condition of choroido-retinitis may be initiated which may be either continuously progressive or relapsing in character.

But in evaluating choroidal disease it is advisable to remember that although changes which are apparently degenerative tend to get worse with the process of the suns, yet it may happen, especially in the young, that at length they clear up and leave not a wrack behind. It is simple to evaluate on the basis of the sight at the time the case is seen, but only the ignorant can forecast the future.

**Diplopia** (two images of one object, which may be side by side, above and below, or they may be oblique).—Amongst the traumatic causes of monocular diplopia are included dialysis of the iris, lental displacements, and of binocular diplopia paralysis of ocular muscles.

In cases of *paralysis of the muscles* double sight is often accompanied by headaches, vertigo, and nausea, especially when use of both eyes together is attempted. The effects cease if the offending organ is occluded by a shade. The sufferer soon learns that he can obtain single sight by looking in the direction which does not require the use of the paralysed muscle. A coachman with a weak external rectus of the right eye is confused if he looks to the " off " side of his horse, but can see comfortably to the " near " side ; a sailor can see to " port," but gets diplopia in looking to " starboard " ; a miner with incompetent superior rectus can do no work ; a sempstress with paralysed internus has difficulty in stitching, but with paresis of the externus there may be no difficulty. In all, a favourable position is gained by turning the eye in the direction opposite to that of the paralysed muscle.

In almost all kinds of work the seriousness of ocular paralysis depends in great measure upon the presence or absence of diplopia. One man will see objects double when they are at a distance, another only when they are near, and yet another whether they are distant or near.

The injuries which produce paralysis may be direct perforating

wounds which tear the fibres or damage the nerves. Pressure of effused blood on the oculo-motor nerve may cause a paralysis which is relieved when absorption of the hæmorrhage takes place. A direct injury of the pulley may paralyse the superior oblique. Contusions of the skull are not infrequent sources of ocular paralysis. When there is a fracture of the base, the most frequent nerve to be paralysed is the sixth. This may occur *primarily*—that is, at the time of the injury—or *secondarily* and later from pressure of blood or callus on the nerve. In about 25 per cent. of the direct (primary) cases the paralysis disappears if the patient survives. In head injuries paralysis of ocular muscles frequently signifies fracture of the base, consequently when present it may confirm a suspicion that such a fracture has occurred. Even in cases which show no indentation of the cranial bones, ocular paralysis is presumptive evidence of basal fracture.

*Factors in Evaluation.*—When there is a doubt about the traumatic origin of an ocular paralysis it is necessary to examine the patient very thoroughly regarding syphilis. But although we do not find any ataxy nor an Argyll Robertson pupil, and although the knee-jerk is present, we have not absolutely excluded tabes, for in no inconsiderable number of cases the first symptom of grave disease of the nervous system is diplopia from ocular paralysis. A patient permanently pensioned for a doubtful trauma who later on is shown to have been suffering from locomotor ataxy previous to the accident should at least be grateful to his doctor.

*The Use of Prisms* in some cases of paralysis is invaluable, but there are many patients who are not comfortable with them. The personal equation is an important point in considering the evaluation, for, failing prisms, it may be necessary for such a patient to wear a patch over one or other eye, the advantage of binocular sight being therefore sacrificed.

*Assessment.*—Authorities vary considerably in estimating the professional incapacity caused by diplopia. From 10 to 33 per cent. may be considered a fair computation. The French "Guide Barème" grants 5 to 20 per cent. for paralysis of one muscle, and from 20 to 30 per cent. for more.

Magnus and Groenouw have given much attention to paralysis of the extrinsic muscles, and the following tables are the result of their investigation:

*Magnus's and Groenouw's Tables*

| Paralysis of ocular muscles. | Professional capacity, per cent. | | Loss of capacity for work. | |
|---|---|---|---|---|
| | Magnus. | Groenouw. | Magnus. | Groenouw. |
| 1. Paralysis of external muscles of one eye when vision is single at the working distance . . . | 75 | 86–90 | 25 | 10–20 |
| 2. Paralysis of external muscles of one eye when vision is double at the working distance . . . | | 67–80 | 25 | 20–33 |
| 3. Paralysis of external muscles of both eyes in cases in which the work is monocular and the paralysis is in the eye which is used: | | | | |
| 1 muscle . . . | 72 | from 33–67 to 40–80 | 28 | from 33–67 to 20–60 |
| 2 muscles . . . | 68 | | 32 | |
| 3 „ . . . | 62 | | 38 | |
| 4 „ . . . | 56 | | 44 | |
| 5 „ . . . | 46 | | 54 | |
| 4. Paralysis of all the external muscles of the eye used for work . . . | — | at most 33–40 | 100 | at least 60–67 |

## CHAPTER XXVII

## TOTAL LOSS OF AN EYE

An eye may be lost from inflammatory disease, by trauma, by enucleation (complete removal), or by ablation (partial removal). The loss whether from removal or from destruction of function depreciates the value of the sight as a whole, for one perfect eye is inferior to two perfect ones. Monocular vision connotes: (*a*) loss of perception of relief; (*b*) the disability known as "false projection," which interferes with the accomplishment of work requiring fine adjustment and the estimation of distance and size; (*c*) the loss of 1/6 of the field of vision and a part of the field of fixation; (*d*) the constant danger of the loss of the sound eye—that is, the risk of total blindness. As a rule the right is the more valuable eye. It is the one most often used by watchmakers and by those who work with the microscope, telescope, etc. This preferential use of the right is probably related to the similar use of the right hand, for we find that left-handed people generally employ the left eye for monocular work.

Another reason for considering the right the more valuable eye is that the left is more exposed to accidents. Statistics show that the left is oftener injured than the right, in the proportion of five right eyes to seven left, according to some observers. In the German report of the 1870 war it is recorded that in 100 cases of ocular wounds, 47·6 per cent. befell the left eye and 40·3 per cent. the right eye, whilst in both eyes the percentage was 9·7. Consequently he who has lost his right eye is more likely to become binocularly blind than one who originally lost his left. If each eye were insured separately a larger premium would be justified in the case of the left than the right.

An eye which is blind but looks normal, as in optic atrophy for instance, is worth more than an empty socket, for the loss will not be obvious to every passer-by. The sufferer will not have the expense of an artificial eye, which has to be renewed from time to time, nor the minor discomfort of epiphora, etc.

What has a man lost who has lost an eye? Provided that the uninjured eye is perfect he has lost nothing as far as distant sight is concerned, but he has a diminished field of vision to the extent of one-sixth. It is, too, a valuable sixth, because it

guards him against collision with objects on that side. In addition he has lost binocular function, and with it his sense of "relief" has become impaired; to some extent this sense always exists in the monocular, because it is recognized by judgment of distance, by experience of position.

Acuteness may be improved by education, although in late life with difficulty. His colour sense remains unimpaired. His total loss, then, is the sense of relief and one-sixth of his field of vision, and if these are not required for his work he is practically little the worse by becoming monocular. A labourer can earn his accustomed wages.

But what of the slater, the man who lives on the housetop, where one false step, due to inappreciation of position, will hurl him to destruction? He has lost his livelihood when he has lost his sense of relief. The coachman in the streets of London can no longer guide his cab between the Scylla of tramcars on one side and the Charybdis of brewers' drays on the other, for his judgment is at fault and his field of vision contracted.

A young man who has lost an eye will get accustomed to monocular vision, for its disadvantages will tend to diminish, as far as orientation is concerned, with the flight of time, and in about nine months he will have satisfactorily replaced binocular sight by monocular.

The man who becomes functionally monocular by slowly advancing disease is not in so disadvantageous a position as he who suddenly loses his sight. *Pari passu* with the deterioration there is a compensatory re-education which restores his faculty of accurate estimation of space and distance.

But always in the early days after a *sudden* loss of sight in one eye the harmonious co-ordination of eye and hand will be found lacking, and in not a few cases is the cause of extreme mental depression. Re-education and adaptation teach the truth that the hand cannot say of the eye I have no need of thee.

*Factors in Evaluation* for the loss of one eye or the sight thereof.—When the eye is blind and it is not necessary to remove it, the disadvantage may be visible or invisible. The blind organ may have the appearance of a healthy one, even the reactions of the pupil may be present, and it may in no respect differ apparently from the fellow-eye. Such being the case the lowest amount of pension which a man is entitled to claim for a blind eye will be awarded.

But if instead of an eye without any outward and visible sign of disease we have to deal with a deformed one, a considerably larger pension seems indicated. There may be a very

disfiguring staphyloma of the cornea, or leucoma adherens. Even though the cornea be healthy there may be a repulsive ectropion. These call for a full allotment, although the expert may hesitate to grant it if the decision is to be a permanent one, for he knows that a successful operation on the lids may remedy the disfigurement, or, in the case of the staphyloma, that an enucleation, followed by the adjustment of the prosthesis, may have a happy result. Such instances suggest that a rule of granting an irrevocably permanent pension may not always be advantageous to the recipient, for the expert in his desire for justice may sometimes allot a lower sum because he believes that the patient will not be content to put up with a remediable deformity for the rest of his life.

*Will Sympathetic Disease Supervene?*—When a case is presented for final evaluation, and a blind and perhaps shrunken eye remains in the socket, especially if the wound has been a perforating one in the ciliary region, the prognosis with regard to the late onset of sympathetic disease must be considered. If the eye is found to be quiet, painless, and without signs of irritation or discomfort, it may be safe to leave it *in situ*. But if, without any other symptom, the eye is tender to the touch weeks or months after the patient has been considered convalescent, it is a menace to its fellow, and the patient should be firmly advised to have the exciting eye removed. Sympathetic ophthalmia after fracture of the orbit, which was very frequent, according to Otis, in the War of Secession, has been remarkably infrequent in the present war. This satisfactory fact is probably due to the efficiency of the Medical Department, special care being given to cases in which the disease may occur. At the Bath War Hospital no cases of sympathetic disease have been seen in wounded men sent home from the front. Three cases of sympathetic irritation quickly recovered on removal of the exciter or of fragments of it.

Cases in which the eye has been enucleated may be divided into two series: (1) those in which a glass eye can be worn, and (2) those in which it cannot. A well-made prosthesis, exactly matching the sound eye, is a masterpiece of constructive imitation of nature, and the pension called for is in inverse proportion to its successful adjustment, but there are sockets which will not tolerate a foreign body, no matter how cleverly chosen. Again, scars, deformities, adhesions, and shrinking prevent in some cases the insertion of a glass eye altogether, and the unfortunate man may be condemned to wear a patch over the empty socket for the rest of his life. For such, a high-grade pension is undoubtedly right.

*False Imputation.*—Claims have been made in the French Courts by soldiers for compensation for the enucleation of an eye said to have been necessary from disease due to military service. At the hearing it was proved that the enucleation had been done prior to mobilization.

When loss of sight of one eye is ascribed to an accident which happened weeks or months before the examiner saw the patient it is necessary, if there is no obvious cause, to investigate the case in some detail. Ophthalmoscopically we perhaps find no signs of retinal or hyaloid hæmorrhage, no detachment of the retina, no atrophy of the disc, no opacity of the lens, the appearances in all these respects being normal, and we find also the pupillary reflexes present.

Beginning with the history of the accident, and with the help of the medical report of the first surgeon who saw the case, we find out whether there was evidence of concussion, of fracture of the base, or of other severe injury likely to produce direct brain laceration, or at least ecchymosis of the visual centres. In any of these cases the presence of pallor of the disc would suggest an early stage of atrophy, and we should examine the field of vision for contraction, and also test the patient for deficiency of colour sense. But a severe concussion without physical destruction of brain may have initiated a neurosis of which the amaurosis or amblyopia is a symptom. It is not, however, likely to be the only one. If we can exclude both physical disease and neurosis we pass on to the consideration of general diseases which may be associated with amblyopia. The urine is examined for sugar, because it is well recognized that this may be present in a patient in whom there are the outward appearances of perfect health. Monocular amblyopia, however, in diabetes is rare. It is also rare in tobacco and other forms of toxæmia, whether of exogenous or endogenous origin.

In these latter, too, we should find that the peripheral vision was better than the central—that is, the reverse of what is found in nerve atrophy ; and also there is likely to be a central relative scotoma for red and green.

A *congenital* deficiency of function may account for the monocular blindness, and we inquire whether a squint has ever been observed, for anything which interferes with binocular vision may produce amblyopia. The squint associated with amblyopia is usually divergent. If the patient acknowledges having had a squint in childhood, the exact date at which it was noticed is important, because if it was before the age of six the amblyopia is likely to be greater than if the obliquity was noticed at a later age.

There may have been a strabismus associated with hypermetropia, in which case it will probably be convergent; and when so it is to be expected that the field of vision will be full.

An amblyopic eye with a high amount of hypermetropia, or hypermetropic astigmatism (the other eye having only a small or no error), is suggestive of amblyopia ex anopsia.

*False Imputation* is often based upon an old amblyopia, and it is a difficult problem to deal with, because the patient is truthful regarding the impairment of sight, but untruthful regarding its cause. Standing on the vantage ground of truth he weaves in untruths in the meshes of his story.

> The lie which is all a lie may be met and fought with outright,
> But a lie which is part a truth is a harder matter to fight.

*Assessment.*—The total physical destruction, or the total loss of sight, of an eye entails a diminution of working capacity of 25 per cent. in trades with weak visual requirements, and of 33 per cent. in trades with high requirements.

A man may also sometimes have acquired a deformity which cannot be hidden, for he may not be able to wear a glass eye, hence the wide margin of difference which is met with in the evaluation by different authorities. There may be a contracted socket, cicatrical bands, lost or deformed lids.

Among the wounded in war we find cases in which not only is the eye destroyed, but the surrounding orbit, frontal sinus, nose, and malar bone have disappeared, and are replaced by a yawning chasm of the most repellent description. The highest pension possible for disfigurement of the face is a poor recompense for the deformity.

In Germany the loss of an eye in an unskilled labourer is evaluated at $33\frac{1}{3}$ per cent. at first, but as time goes on and adaptation takes place, it is gradually reduced to 25 per cent. A skilled labourer begins with from 30 to 40 per cent., subject to diminution. Æsthetic appearance has a distinct commercial value, and each case must be judged on its merits, for an employer may have doubts about the capacity for work, and fellow-workmen may object to a disfigured colleague.

It is right, therefore, to add on an additional 5 to 10 per cent. for an empty socket, or, when a glass eye cannot be worn, from 10 to 20 per cent.

In France a workman or soldier who loses one eye is awarded 33 per cent., or in some cases 30 per cent.—that is, an annuity of 270 francs. No difference is made whether the eye has been removed or not.

Golebiewski gives the following table for injuries of the eyes in Germany:

| | |
|---|---|
| Loss of one eye (more in certain trades) | 25–33 per cent. |
| Loss of an eye when the sight was defective in the other | 75 „ |
| Loss of an eye and diminution of sight in the other one (based on the acuity which remains) | 50–80 „ |
| Injury of the right eye and consecutive symblepharon | 30–50 „ |
| Loss of both eyes | 100 „ |
| Diminution of sight in one eye | 10–30 „ |
| Loss of the sound eye when the other is blind | 100 „ |
| Various injuries with adhesions and other deformities. | 10–50 „ |

Baudry records the following awards for loss of an eye in French Courts of Justice:

| | |
|---|---|
| Loss of an eye by an individual who has congenital weakness in the other eye | 75 per cent. |
| Loss of an eye by a draper's assistant | 40 „ |
| Loss of an eye by a mason, threatened with the necessity of giving up his usual work | 40 „ |
| Loss of an eye by a day labourer | 33 „ |
| Loss of an eye by a stonebreaker | 33 „ |
| Loss of an eye by an employee in an arsenal | 33 „ |

In other cases 25 per cent. has been awarded

The evaluation of the loss of an eye at 50 per cent. was supported by Zehender in 1889, but was reduced by him later to 33 per cent., and this is generally accepted in France.

Chavernac states that in Halle in 1887 an inquiry showed that 90 per cent. of one-eyed men earned the same salary as before the accident to the eye, the residue suffering a reduction of from 5 to 20 per cent. In 1894, 60 per cent. earned the same salary, and 40 per cent. from 6 to 33 per cent. less.

Knapp estimates the loss of capacity at 17 per cent. Von Ammon says that 58 per cent. of one-eyed men had no reduction of salary, and 42 per cent. a moderate reduction, and that later on, presumably from adaptation, 42 per cent. earned more, 33 per cent. as much, and 25 per cent. less than before the accident, the loss varying from 4 to 12½ per cent.

Chavernac considers that the loss of one eye implies a loss of capacity of from 20 to 50 per cent.

According to the British Military Pension Warrant the loss of one eye is evaluated at 50 per cent., and both eyes at 100 per cent. But a man who has lost one eye has not lost half his sight, and, on the other hand, he who has lost both his eyes has lost all his sight. In the terms of labour requirements the loss of one eye is not the loss of half the industrial capacity, but the loss of both eyes is total incapacity. Consequently the Warrant which grants 50 per cent. for the loss of one eye and 100 per cent. for the loss of two is illogical, and either the 50 per cent. is

excessive or the 100 per cent. inadequate, or else, as seems to the writer, the first is excessive *and* the second insufficient.

In advising a monocular man regarding his future occupation it should be obvious that the fact that he has only one seeing eye should be the basis upon which the advice is founded.

The following case is an instance of lack of judgment in this respect on the part of a pensions committee:

A private, who previous to the war had been a shop assistant, lost the sight of an eye from traumatic retinitis proliferans, without disfigurement, and was consequently pensioned at 13s. 9d. per week. Wishing to change his occupation he applied to the committee to be re-educated as a secretary. Arrangements were made by which he received tuition in typewriting, shorthand, French, and Spanish, all of which were paid for out of public funds.

It does not seem to have occurred to the committee that re-education at the public expense should be for those who in consequence of war disability are unable to take up the threads of their original career. In this case the new occupation chosen was particularly unfortunate, for the man's only eye was myopic, and therefore not very suitable for the work of a shorthand-writer and typist. Moreover, it should not have required much reflection to decide that a crowded profession like typewriting should as far as possible be reserved for those who are incapacitated for an active life, such, for instance, as one-legged men, cardiac cases, and so on.

The decision to re-educate a pensioner should not be finally arrived at until the opinion of a medical man is obtained regarding the proposed profession.

*Relative Blindness.*—The analogy between life and death, on the one hand, and blindness, on the other, is illustrated by the condition called relative blindness: for as the body may be in a condition of suspended animation, so also the eyes may be in a state in which sight, though present, is suspended.

Normally this happens when, for instance, a microscope or telescope is used; one eye only sees, the other is visually dormant.

*Absolute* loss is a condition in which nothing is to be hoped for with regard to sight in the future; the eye is either anatomically or physiologically dead. No operation, no treatment can avail, and permanent blindness is certain.

Relative loss, on the other hand, is that state in which an eye, though capable, yet ceases to work harmoniously and jointly with the other. Pathologically, relative blindness occurs in patients who have a highly myopic eye harnessed to a fellow-eye which is either emmetropic or hypermetropic. In all such cases

it frequently happens that the myopic eye alone is used for reading and writing, while the other is retained for distant sight alone—that is, they are alternately dormant.

The chief *traumatic* causes of relative blindness are squint, loss or displacement of the lens from operation or accident, and diplopia from paralysis of the external ocular muscles.

When two eyes are unequally yoked together in the manner we are considering, the better one is sometimes used for all purposes, and in order to prevent confusion the other is occluded. At such a time the weaker eye is an encumbrance, nevertheless it is a visual reserve which is likely to be of value if from any cause the working eye should be disabled.

After a successful operation for cataract, professional sight does not exist in it if the other eye is sound. But as time goes on the better eye may fail, and then the one that has been operated on is likely to resume active function. Or again, a workman, as the result of an accident, may have paralysis of an ocular muscle, and with it diplopia when he uses both eyes, but by occluding either he may see comfortably—that is, he is physiologically (P), a binocular man, but professionally (Pr) monocular. It sometimes happens that relative blindness occurs in both eyes, or it may be that it is immaterial to the patient which eye he uses. This is sometimes the case when both eyes have been operated on for cataract.

*Assessment.*—Relative loss of an eye is less serious than absolute loss, and the pension awarded should be on a lower grade.

If an operation has been successfully done for cataract on *both* eyes, and there is relative loss of sight, the deficiency should be evaluated at 50 per cent. and upwards, according to the vision of the better eye.

In cases associated with diplopia, 10 per cent. When *both* eyes suffer from relative loss of sight, from 50 per cent. and upwards.

In the case of successful cataract operation on one eye, the other being good, 15 per cent. as a minimum may be granted.

### Total Loss of Both Eyes

What supports me, dost thou ask ?
  The conscience, Friend, to have lost them overplied
In liberty's defence, my noble task,
  Of which all Europe rings from side to side.
This thought might lead me through the world's vain mask,
  Content though blind, had I no better guide.

He who has lost both eyes has no physiological sight, and therefore no professional sight, but in certain professions wages

may be earned without either. A blind musician, for instance, may be able to get a living, while a vocalist may be competent to earn even more. A beggar who loses both eyes may be pecuniarily in a better position than he was before his calamity, for his sad lot excites commiseration. A pitiful condition is a commercial asset.

In all cases of binocular loss of sight, service of a guide must be allowed for in evaluating the incapacity.

By the French law of 1831, blindness is described as the total and irremedial loss of sight, but this precise definition was found practically to be too rigid, and therefore to increase its elasticity a condition called " practical blindness " was invented, and in it were included all those who, though they had not total loss of sight, yet suffered from total incapacity for work. The limits for these amblyopes was fixed at vision equals, or is less than, one-twentieth (3/60) in one eye, and less than one-twentieth in the other. All such subjects were pensioned as though they were blind.

In Germany blindness includes vision which is not more than 1/25. In Britain it is vision which is insufficient for the performance of work for which sight is necessary.

*Factors in Evaluation.*—Difficult cases to forecast are those of retinal hæmorrhage in which sight is reduced to a mere perception of light. Many of them are ameliorated by time, sometimes unexpectedly, as the war has taught us. Functional cases of traumatic neurosis, again, after a long stationary period may suddenly or progressively become better. In these cases we must decline to say how long it will take for the patient to recover or to become fit to return to the front, no matter how imperative may be the pressure of official authority. Still more must we decline to be hustled when our verdict is to be a final one for evaluating a pension and there will be no opportunity of revision, except upwards. For we have both a responsibility in the matter to our country and a duty to our patient. When his disability increases his pension will be augmented, but what of the man who after a long time unexpectedly recovers ? " Permanent " is an inaccurate word to apply to an alterable pension, and if the Pensions Warrant is to stand, should be changed to " permanent minimum."

*Traumatic* blindness may be due to manifold causes, the differentiation of which is necessary before it is possible to decide whether the time has arrived to make a prognosis regarding the ultimate issue.

The blindness may be caused by *extra-ocular* injuries, as, for instance, in the occipital lobes, lesion of the optic nerves, or by

traumatic neurosis, unillumined by physical findings. These extra-ocular sources of blindness are always serious, and no improvement is likely to occur except in the case of neurosis.

Or the cause may be *intra-ocular*, for instance from retinal or vitreous hæmorrhage, cataract, posterior synechiæ, scars of the cornea. Though they differ widely in the manner in which they act the result is the same—blindness.

*Assessment.*—

Doth God exact day-labour, light denied ?

They also serve who only stand and wait.

The loss of two eyes is a greater calamity than the loss of two limbs, and few will be found to object to a high estimate of the incapacity. In Britain 100 per cent. is accorded, in Germany 125 per cent., and in France a soldier or a workman receives 100 per cent. (£48). For so overwhelming a catastrophe a pension of from 100 to 125 per cent. is reasonable and sufficient if the recipient is able to add to it by some form of industry. But if, from the nature of his injuries or from the condition of his general health, he can do no supplementary work, and he is consequently deprived of the luxury of self-help, an extra bonus should be awarded to enable him to obtain some modest increase of his comfort.

The additional 20s. per week which is granted by the British Warrant for the services of a guide cannot be considered a part of the blind man's income.

Under no circumstances should it be necessary for a blind man, whether formerly a soldier or always a civilian, to resort to street mendicancy in any form.

In this commercial age there are still some few things for which money is not a medium of exchange. Wealth untold cannot cover death ; gold cannot repay blindness. They who have lost their sight in the world's broad field of battle can never be recompensed, but at least we should care for them with no unstinted measure when the bivouac of life has given place to the solitude of darkness. For them, if for them alone, let us err on the side of extravagance, remembering that sight, like life itself, cannot be evaluated. But let this " extravagance " be for habilitation of capacity and subsequent replacement of the man in the arena of industry. The pension which makes effort unnecessary makes misery certain.

### Partial Loss of Sight in One Eye

In countries where the decimal system is used the loss of sight is more easily evaluated than in Great Britain. If the

value of one eye is fixed at 33 per cent. and sight is registered in tenths, each of these tenths will correspond to a loss of a tenth of 33 per cent.—that is, 3·3. A workman who loses 8/10 of the sight of one eye loses 3·3 × 8—that is, 26·4 per cent. of his total sight.

Let us see how this works out by British methods of vision-testing and in current coin of the realm. We will suppose that the full pension for the loss of two eyes is 30s. per week, and for one eye 10s. It is easy on this basis to evaluate partial losses in one eye.

| | | | | |
|---|---|---|---|---|
| For V = 6/60 | the loss is | 9/10 | of 10s. | = 9s. |
| „ V = 6/36 | „ | 5/6 | „ | = 8s. 4d. |
| „ V = 6/24 | „ | 3/4 | „ | = 7s. 6d. |
| „ V = 6/18 | „ | 2/3 | „ | = 6s. 8d. |
| „ V = 6/12 | „ | 1/2 | „ | = 5s. |
| „ V = 6/9 | „ | 1/3 | „ | = 3s. 4d. |
| „ V = 6/8 | „ | 1/4 | „ | = 2s. 6d. |

In the French "Guide Barème" (1917) an eye is valued at 30 per cent. and sight is reckoned in tenths, each loss of a tenth corresponds with a loss of tenths of 30—that is, 3. For instance, a soldier has lost 7/10 of sight in one eye, he has lost then 3·0 × 7 = 21 per cent. of total sight in this eye—that is, 20 per cent.

A puzzling feature in the Pension Warrant is the absence of any reference to partial loss of sight. Loss of vision of one eye is mentioned once only, and it is almost certain that in this case total loss is meant. This lack of precision is liable to be a source of difficulty to assessors in cases in which sight is defective though not entirely absent. Go-as-you-please methods of assessment create dissatisfaction, for they will vary within wide limits according to the sense of proportion of examiners. Discontent is also liable to arise if two men, for instance, each with V = 6/12, compare notes and discover that equality of injury does not necessarily mean equality of pension.

### Partial Loss of Sight in Both Eyes

It is more complicated when we evaluate the depreciations existing in both eyes unless the loss of sight is equal in the two eyes. The value of one eye is 33 per cent. (1/3, i.e. 10s.), of the other 66 per cent. (2/3, i.e. 20s.). Let us suppose that the man has lost a quarter of his sight in each eye (V = 6/8).

1/4 of 10s. = 2s. 6d. + 1/4 of 20s. = 5s.—total 7s. 6d.

It may, however, happen that the loss is not equal in the two eyes, and we have to decide which one is nominally worth one-third and which two-thirds (10s. and 20s.).

If the less injured eye is the one which we value at one-third, and the more injured one at two-thirds, the pension will be greater than if we reverse the values. An instance will make this clear. A man, as the result of an injury, is left with vision right eye 6/12 and left eye 6/36; the right eye being the less injured one is only worth one-third and he will receive 5s. for it; for the left eye, the more injured one, he will get 16s. 8d.—total 21s. 8d.

But if we reverse the valuation, giving two-thirds to the right eye and one-third to the left, he will receive, right eye 10s., left eye 8s. 4d.—total 18s. 4d.

Which is the fairer solution? British sporting instinct suggests "splitting the difference" (21s. 8d. + 18s. 4d. = 40s. ÷ 2 = 20s.). But when one eye is seriously depreciated and the other only very slightly, such a rule will not work out equitably, and the following suggestion has been made by Chavernac:

(*a*) If vision is more than 6/12, each eye only counts as a quarter.

(*b*) If vision is more than 6/12, in one eye and below that in the other the more feeble eye counts for a quarter and the stronger for three-quarters.

(*c*) If vision is less than 6/12 in both eyes, the more feeble counts for three-quarters and the stronger for one-quarter.

The difficulty of accurately scheduling incapacity, as long as our method is based on 6/6 and fractions thereof as our standard, is exemplified by the table on p. 589.

Has not the time arrived when we should give up the duodecimal in favour of the decimal system?

### Total Loss of Sight in One Eye and Partial Loss in the Other

If we accept Zehender's evaluation, blindness is rated at 100 per cent. and loss of sight of one eye at 33 per cent., the second eye is then worth 100 − 33·33 = 66·66. (Usually this is considered to be 30 and 70.)

One eye, then, represents approximately 1/3 of the total loss, and the other 2/3.

Let us take the case of a man who has totally lost the sight of one eye and 4/10 of the other. In such the French "Guide Barème" of 1917 states that the sight of the second eye should be calculated as follows: The second eye, representing 2/3 of total sight, that is, 70 per cent., each loss of 1/10 corresponds with a loss of tenths of 70, that is, 7·0. The partial loss being 4/10 will equal 4 × 7·0 = 28 per cent. The assessment of injury will then equal 30 + 28 = 58 per cent.

The following tables are given by Chavernac:

*Incapacity per cent. resulting from the partial or total, absolute or relative, loss of central sight of one eye, according to the three grades of trades*

| Vision of the injured eye. | Incapacity. | | |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 0·9 | 2 | 2·5 | 3 |
| 0·8 | 4 | 5 | 6 |
| 0·7 | 6 | 7·5 | 9 |
| 0·6 | 8 | 10 | 12 |
| 0·5 | 10 | 12·5 | 15 |
| 0·4 | 12 | 15 | 18 |
| 0·3 | 14 | 17·5 | 21 |
| 0·2 | 16 | 20 | 24 |
| 0·1 | 18 | 22·5 | 27 |
| Complete and absolute loss . . . | 20 | 25 | 30 |
| Relative loss . . | 10–20 | 15–25 | 20–30 |

*Incapacity per cent. resulting from the partial loss of central sight of the two eyes, according to the three grades of trades (the sight being in both eyes superior or equal to 5/10 of normal sight)*

| Vision. | 1 | | | 0·9 | | | 0·8 | | | 0·7 | | | 0·6 | | | 0·5 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 2 | 2·5 | 3 | 4 | 5 | 6 | 6 | 7·5 | 9 | 8 | 10 | 12 | 10 | 12·5 | 15 |
| 0·9 | 2 | 2·5 | 3 | 4 | 5 | 6 | 6 | 7·5 | 9 | 8 | 10 | 12 | 10 | 12·5 | 15 | 12 | 15 | 18 |
| 0·8 | 4 | 5 | 6 | 6 | 7·5 | 9 | 8 | 10 | 12 | 10 | 12·5 | 15 | 12 | 15 | 18 | 14 | 17·5 | 21 |
| 0·7 | 6 | 7·5 | 9 | 8 | 10 | 12 | 10 | 12·5 | 15 | 12 | 15 | 18 | 14 | 17·5 | 21 | 16 | 20 | 24 |
| 0·6 | 8 | 10 | 12 | 10 | 12·5 | 15 | 12 | 15 | 18 | 14 | 17·5 | 21 | 16 | 20 | 24 | 18 | 22·5 | 27 |
| 0·5 | 10 | 12·5 | 15 | 12 | 15 | 18 | 14 | 17·5 | 21 | 16 | 20 | 24 | 18 | 22·5 | 27 | 20 | 25 | 30 |

*Incapacity per cent. resulting from the partial or total, absolute or relative, loss of central vision of the two eyes, according to the three grades of trades (vision being superior or equal to 5/10 in one eye and inferior to 5/10 in the other)*

| Vision. | 0·4 | 0·3 | 0·2 | 0·1 | Complete and absolute loss. | Relative loss. |
|---|---|---|---|---|---|---|
| 1 | 10 15 20 | 12·5 17·5 22·5 | 15 20 25 | 17·5 22·5 27·5 | 20 25 30 | from 10 to 30 |
| 0·9 | 17·5 22·5 27·5 | 20 25 30 | 22·5 27·5 32·5 | 25 30 35 | 27·5 32·5 37·5 | from 15 to 35 |
| 0·8 | 15 30 35 | 27·5 32·5 37·5 | 30 35 40 | 32·5 37·5 42·5 | 35 40 45 | from 20 to 40 |
| 0·7 | 32·5 37·5 42·5 | 35 40 45 | 37·5 42·5 47·5 | 40 45 50 | 32·5 47·5 53 | from 25 to 45 |
| 0·6 | 40 45 50 | 42·5 47·5 52·5 | 45 50 55 | 47·5 52·5 57·5 | 50 55 60 | from 30 to 50 |
| 0·5 | 47·5 52·5 57·5 | 50 55 60 | 52·5 57·5 62·5 | 55 60 65 | 57·5 62·5 67·5 | from 35 to 55 |

The following table is taken from Forgue and Jeanbrau, and represents the barème used in Germany when the visual acuity is unequal in the two eyes:

| Physiological acuity of left eye. | Physiological acuity of right eye. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 5/7·5 or 1 to 2/3 0·66 | 5/10 or 1/2 0·5 | 5/15 or 1/3 0·33 | 5/20 or 1/4 0·25 | 5/25 or 1/5 0·2 | 5/35 or 1/7 0·15 | 5/50 or 1/10 0·10 | 5/75 or 1/15 ·075 | 5/100 or 1/20 0·05 | 0 — |
| 1 to 2/3 or 0·66 | 0 | 0 | 5 | 10 | 10 | 15 | 15 | 20 | 20 | 25 |
| 1/2 or 0·5 . | 0 | 5 | 10 | 10 | 15 | 20 | 25 | 25 | 30 | 35 |
| 1/3 „ 0·33 . | 5 | 10 | 25 | 25 | 30 | 30 | 35 | 40 | 45 | 55 |
| 1/4 „ 0·25 . | 10 | 10 | 25 | 30 | 40 | 45 | 50 | 55 | 60 | 65 |
| 1/5 „ 0·20 . | 10 | 15 | 30 | 40 | 55 | 60 | 65 | 70 | 75 | 80 |
| 1/7 „ 0·15 . | 15 | 20 | 30 | 45 | 60 | 70 | 75 | 80 | 85 | 90 |
| 1/10 „ 0·1 . | 15 | 25 | 35 | 50 | 65 | 75 | 85 | 90 | 95 | 105 |
| 1/15 „ 0·075 . | 20 | 25 | 40 | 55 | 70 | 80 | 90 | 95 | 100 | 115 |
| 1/20 „ 0·05 . | 20 | 30 | 45 | 60 | 75 | 85 | 95 | 100 | 110 | 125 |
| 0 . . . | 25 | 35 | 55 | 65 | 80 | 90 | 105 | 115 | 125 | 125 |

The fractions of the horizontal lines indicate the physiological visual acuity of the right eye, and those in the vertical

column on the left that of the left eye. The figures in the other columns indicate in hundredths the diminution of professional acuity, corresponding with this diminution double the physiological visual acuity. Let us make a practical test. A man, we will suppose, has right visual acuity 0·5 and physiological visual acuity of the left 0·1. Following down the column from 0·5 until we reach the horizontal line beginning 0·1, we find 25, i.e. 25/100. The injured man has therefore a binocular visual acuity of (25/100) 1/4. In Germany no compensation is allowed for a diminution of 10 per cent. or less. Total blindness, however, is scheduled at 125 per cent., and extreme deterioration at 105 to 125 per cent.

The following tables are from Groenouw, indicating the reduction of industrial capacity caused by varying diminution of the scientific visual acuity of the two eyes according to trade. The figures in the upper horizontal line represent the acuity of an eye; the figures of the left vertical column the visual acuity of the other. Let us take the case of a man who has a visual physiological acuity of 0·3 in the right eye and of the same in the left eye. In the first table (visual trades requiring maximal sight) the diminution of physiological visual acuity corresponds to a reduction of

*Quota of the Reduction of Industrial Capacity (per cent.) in Round Numbers in Cases of Diminution of Visual Acuity of the Two Eyes for Trades requiring a High Degree of Visual Acuity*

| Degree of physiological visual acuity. | Peripheral vision is preserved. | | | | | | With total loss of peripheral and central vision of one eye. |
|---|---|---|---|---|---|---|---|
| | — | 0·5 | 0·4 | 0·3 | 0·2 | 0·1 or less. | |
| The peripheral vision is preserved. | | | | | | | |
| 1·0–0·6 | 1·0–0·6 | — | 5–10 | 10–15 | 10–20 | 10–25 | 20–33 |
| 0·5 | — | 20 | 25 | 25–30 | 30–35 | 30–40 | 35–45 |
| 0·4 | 5–10 | 25 | 40 | 40–45 | 45–50 | 50–55 | 50–60 |
| 0·3 | 10–15 | 25–30 | 40–45 | 60 | 60–65 | 65–70 | 70–75 |
| 0·2 | 10–20 | 30–35 | 45–50 | 60–65 | 80 | 80–85 | 85–90 |
| 0·1 or less. | 10–25 | 30–40 | 50–55 | 65–70 | 80–85 | 100 | 100 |
| With total loss of central and peripheral vision of one eye. | 20–33 | 35–45 | 50–60 | 70–75 | 85–90 | 100 | 100 |

salary of 60 per cent. But in the second table, which relates to trades requiring ordinary sight, instead of 60 per cent. it is only 40 per cent.

*Quota of the Reduction of Industrial Capacity (per cent.) in Round Numbers in Cases of Diminution of Visual Acuity of the Two Eyes for Trades requiring a Low Degree of Visual Acuity*

| Degree of physiological visual acuity. | Peripheral vision is preserved. | | | | | | | With total loss of peripheral and central vision of one eye. |
|---|---|---|---|---|---|---|---|---|
| | 1·0–0·5 | 0·4 | 0·3 | 0·2 | 0·1 | 0·05 | 0·02 or less. | |
| Peripheral vision is preserved. | | | | | | | | |
| 1·0–0·5 | — | — | 5–10 | 10–15 | 10–20 | 10–20 | 10–25 | 20–33⅓ |
| 0·4 | — | 20 | 25 | 25–30 | 30–35 | 30–40 | 30–40 | 40–50 |
| 0·3 | 5–10 | 25 | 40 | 45–50 | 50 | 50–55 | 50–55 | 55–60 |
| 0·2 | 10–15 | 25–30 | 45–50 | 60 | 65 | 65–70 | 65–70 | 70–75 |
| 0·1 | 10–20 | 30–35 | 50 | 65 | 80 | 85 | 85 | 85–90 |
| 0·05 | 10–20 | 30–40 | 50–55 | 65–70 | 85 | 90 | 95 | 95 |
| 0·02 or less. | 10–25 | 30–40 | 50–55 | 65–70 | 85 | 95 | 100 | 100 |
| With total loss of central and peripheral vision of one eye. | 20–33⅓ | 40–50 | 55–60 | 70–75 | 85–90 | 95 | 85–90 | 100 |

## Field of Vision

*Contraction* of the fields of vision occurs, not only in sequence to injuries of the head, but also in severe accidents and war wounds involving other parts of the body.

A slight contraction is not usually detrimental to any form of handicraft, and is unappreciated by workers, but if sight is confined within 60° of the fixation point in both eyes, it will interfere with full efficiency. Still more will the incapacity be augmented if it is within 30°, as not only the personal safety of the worker will be threatened, but also the work will be impeded of those who are engaged—(*a*) in houses, such as masons, tilers, painters, whitewashers, decorators, glaziers, window-cleaners, etc.; (*b*) in factories, or wherever machinery is used; (*c*) in all occupa-

tions in which rapidity of action and a full view are required, such as those of sailors, soldiers, policemen, chauffeurs, coachmen, and railway officials. Contraction in the lower part of the field is especially obnoxious from the stumbling over obstacles which it occasions.

In some trades, such as watchmaking and bootmaking, even very considerable contraction is of no consequence.

*Assessment.*—When within 30° of the fixation point, the resultant incapacity should be evaluated at from 50 to 100 per cent.

If within 60°, everything depends upon the requirements of the man's work, the estimates varying from 5 to 20 per cent.

Limitation of the field in one eye only in that part which is normally seen by both eyes entails no industrial incapacity, and therefore requires no evaluation; but if there be a lacuna in the external part of either field it may be a detriment to work, because the blind part is not compensated for by the other eye. But under any circumstances, as the joint field is 5/6ths of the whole, the loss cannot exceed 1/6th, and 10 per cent. will cover this loss.

The contraction seen in functional disease is usually a detail in the underlying and more serious neurosis which has mainly to be considered in making an evaluation.

*A Scotoma* is a desert of blindness in the visual panorama, and may be due to a lesion in the eye or in some part of the nervous system concerned in sight. While contractions involve the periphery, scotomata do not.

When situated in the central part of the field a scotoma produces an industrial incapacity almost as great as blindness, and should be evaluated as such; but if, on the other hand, it is peripheral, the disqualification for work is likely to be merely nominal and may be ignored.

*Assessment.*—If the seeing area is contracted within a 60° limit, the incapacity amounts to 20 per cent.; and if central vision alone is retained, professional sight is abolished.

Scotomata which are not central cause no incapacity.

*Hemianopsia*, whether complete or sector-like in character, is an impediment to manual labour. Fortunately it is rare, and when it does occur the associated lesions of the central nervous system are frequently so serious that work of any description is contraindicated.

Loss of the right half is more serious for writers and readers than loss of the left half of the field, and it is justifiable to increase the pension in the former case. Schröter suggests 45 per cent. for right hemianopsia, and 30 per cent. for left.

*Assessment.*—The evaluation of defects of the field of vision is schematized by Chavernac in the following table :

*Incapacity per cent. resulting from the Partial or Total Loss of Peripheral Sight of One or Both Eyes*

| | Professions requiring good peripheral sight. | | Professions compatible with less extensive peripheral sight. | |
|---|---|---|---|---|
| | One eye. | Two eyes. | One eye. | Two eyes. |
| Retraction to 60° . . | 0 to 10 | 5 to 20 | 0 | 0 to 5 |
| Retraction to 30° . . | 10 to 20 | 20 to 50 | 5 to 10 | 10 to 20 |
| Retraction to 5° . . . | 20 to 30 | 100 | 10 to 20 | 100 |
| Absence of nasal half . . | 0 | 0 to 15 | 0 | 0 |
| Absence of temporal half . | 0 to 15 | 30 to 60 | 0 | 10 to 50 |
| Hemianopsia . . . | 0 to 15 | 50 to 80 | 0 | 40 to 70 |

## Traumatic Psychoneuroses

*Traumatic Ocular Neurosis* is seen very frequently in soldiers invalided from war. It produces, according to Borel, the following symptoms :

*Phenomena of Motion.*—Nystagmus, insufficiency of convergence, blepharospasm, squint, astigmatism, paralysis or spasm of accommodation, mydriasis.

The blepharospasm is best seen by standing the patient in the position for testing for Rombergism, with the eyes closed.

*Phenomena of Sight.*—Erythropsia (red vision), monocular diplopia, micropsia, photophobia, retraction of the visual field and inversion of colours, amblyopia, scotomata, hemianopsia, blindness.

*Phenomena of Sensation.*—Neuralgia, loss of muscular sense, anæsthesia of the cornea and lids.

*Assessment.*—As the symptoms will eventually disappear, a permanent evaluation is not called for. Chavernac points out that neurosis begins after the accident and ends after the fixing of the pension, a dictum sufficiently scathing but insufficiently accurate.

*Traumatic Psychoneuroses* may occur in soldiers whose eyes are wounded or whose sight is affected by ocular or occipital injuries.

Mental symptoms may follow, especially among those who

have hereditary tendency, after exposure to shell-fire and prolonged trench life. Or it may be a taint of syphilis or a weakness for alcohol which predisposes to mental instability. In some, congenital or acquired emotivity gives rise to prolonged disability and incapacity for military duty.

The re-education of these unfortunate patients should be begun early, before even the ocular wounds are healed; they are then less likely to acquire the habits of introspection and self-pity. Those who are congenitally emotive are more difficult to deal with, and are longer in responding to suggestion and other forms of treatment than those whose emotivity is acquired.

Eye disease is notoriously depressing under any circumstances, how much more must it be when associated with the horrors of war. For wounded eyes under these adverse accompaniments, the occlusive bandage should be used as rarely as possible, consistent with the due treatment of the case, for darkness fosters inertia, and the blindfolded soldier broods over the future, and so hinders functional restoration. Sympathetic visitors to the hospital ward unwittingly increase his introspection by pity; a sermon in which resignation is the exordium and submission the peroration will not help on the process of adaptation. Eventually a patient who should have recovered becomes a mental wreck and a semi-invalid for life. Bandages and visitors should alike be abolished whenever practicable, and replaced by neutral-tinted glasses (when essential) and common-sense friends. The patient should be encouraged to forget himself, and if his eyes permit he should take outdoor exercise with cheerful companions—gardening, fishing, golf. All indoor mechanical apparatus, whether Swedish or otherwise, perpetuate the neurosis by suggestion. The sham bicycle and the artificial rowing machine—"like horses at a mill, not moving on nor standing still"—should be avoided, and all occupations reminiscent of the punishment of Sisyphus should give place to the outdoor realities—on the road and on the river—where the patient's attention will not be focussed on his eyes, nor his thoughts on his limbs. Interest is aroused by mild competition, short of fatigue, by tennis, quoits, and so on, and with them there is no need of trained attendants to apply the remedies. Of other apparatus which supply motor power to exercise joints it may be said that as a general rule it is better for the man to work the machine than the machine the man. Unless these oculo-mental cases are taken in hand early, definitively, and thoroughly, with the help of an alienist, when necessary, they are likely to become lifelong acquaintances of the Pensions Commissioners.

The term "shell-shock" is applied, somewhat indiscriminately,

to cases in which subjective symptoms are more pronounced than objective ones—to neuroses which are more or less unassociated with demonstrable lesions—to psychical rather than to physical syndromes. A more definite diagnosis is requisite when the question of treatment arises, and again later when the question of awarding a pension (that is prognosis) has to be answered. The subjective symptoms may so camouflage the objective that it may be difficult to localize any organic pathological basis, but we cannot "wait and see" for ever. In doubtful cases assistance is often afforded by a means which may be overlooked—namely, an examination of the sense of sight. The following instances illustrate the value of so doing:

Two soldiers in the front line were "buried" by shell explosion, and each was quickly rescued, although in an insensible condition. There were wounds of the body and limbs, but no fractures. They were at once attended to by the medical officer in the advanced dressing-station, details of their injuries were recorded on their field cards,* and they were dispatched to the rear by ambulance.

When the insensibility had passed away they had no recollection of the cataclysm which had overwhelmed them. In due course the patients were dispatched to an English hospital. In each mental disturbance was present—a blend of amnesia, aphonia, and melancholia; and as epiphenomena, hyperidrosis and tremor. On examining the eyes, in one there was found a field of vision contracted within 35° of the fixation point, with inversion of the red; in the other, homonymous hemianopsia. These findings differentiated the cases: the former, dynamic purely; the latter, static, indicative of organic lesion. Thus in the first example the aphonia was instantly cured by suggestion. In the second the hemianopsia defied suggestion and apparently is permanent in nature, although the associated subjective symptoms tend to disappear. The first required encouragement, assurance of speedy convalescence, and cheerful society; the second probably had a hæmorrhage in the occipital lobe and needed quiet and two months' reposeful life in bed or on a couch. If the hemianopsia does not disappear in the first few months after the receipt of the wound it is likely to remain for life. Consequently the objective case will require a permanent moderate pension, but the subjective one will not.

In the harmony of mind and matter it is nerve, not muscle, which rules. Evaluation of injuries of the eyes is based, not only on the correlation of anatomical possibilities and functional potentialities, but also on the psychic idiosyncrasies of the individual. The expert who has the final word in fixing the pension should be one who has a brain to judge and a heart to feel—one who in dispensing justice does not forget to add the milk of human kindness.

* A tribute of admiration is due to the front-line surgeons for the accuracy of these first epitomes of the condition of the wounded—terse records drawn up in an atmosphere redolent of gas, with thunder resonant Verily there is no shell-shock in the R.A.M.C.

Patients, whether civilian or military, are not all potential malingerers, but the great majority of them are straightforward men or women, who, during the exercise of their duty in the service of the world, have fallen victims to circumstance.

My friends, I do not ask for men like these
A little dole, a little time of ease.
For them and all who love them, all who mourn,
And all that to their faith shall yet be born,
I ask you this—take them for what they are,
Your Comrades in the Service, Life at War.

## CHAPTER XXVIII

## ADAPTATION IN INJURIES OF THE EYES

> Yet I argue not
> Against Heaven's hand or will, nor bate a jot
> Of heart or hope; but still bear up and steer
> Right onward.

By adaptation we mean the process by which the handicap resulting from injury is neutralized in the struggle for existence.

In eye disease, whether due to trauma or otherwise, one of the most important duties of the surgeon, before saying good-bye to his patient, is to advise him how he can overcome any disadvantageous position in the competitive market of existence which results from the disease. In a more general sense adaptation is Nature's method of providing for the survival of the fittest, but her process is slow and is spread over countless generations: with the individual we are hampered by the necessity of compressing the adaptation within a few months or a year or two. How the individual can be taught to earn more money is the commercial side. How he can be taught to make the best of life is the moral and social.

### Adaptation in Blindness

There is no nobler instance of human pluck than that of a man who in the prime of life has suddenly become blind, but who, instead of being overwhelmed by his misfortune, bravely readjusts his life and makes himself independent of charity. And such is a true picture of many a one of Britain's sons wounded in her service. The sudden catastrophe has closed the door on his past life, and he stands on the threshold of an unknown future.

Before we advise a recently blinded man regarding his choice of profession we must know something of his personal idiosyncrasies, his bent, and his capacity, and we should give due consideration to the following propositions:

(1) What was his previous occupation, and can he be re-adapted to the old or must he be adapted to a new one?

(2) Has he sustained any other injury, besides that to

his eyes, which will interfere with an occupation otherwise suitable ?

(3) What is his temperament ?

(4) What is his social position ?

(1) If his previous profession was that of a clerk, he might perhaps continue by learning typewriting. A solicitor may still be able to plead in court and advise clients. A clergyman need not resign his living. A musician can still be a musician, and can supplement his income by piano-tuning.

As a general rule it is better for a man to follow the vocation of his seeing days whenever practicable ; for if his experience is mellow he should reap the harvest.

Those who have been accustomed to an outdoor life, for instance, are likely to chafe at the confinement entailed by typewriting.

(2) With regard to *multiple injuries*, the loss of fingers, for instance, would prevent a musician from continuing his profession, and scars on the face might also, for æsthetic reasons. Loss of fingers might, or might not, negative massage as a calling ; it would depend upon the extent of the injury and the presence or absence of palmar scars.

(3) With regard to *temperament*, we have to find out the particular personal bent of the man ; otherwise the training will be a failure. It is sometimes stated that blind people acquire a more acute sense of hearing. This fallacy would seem to be inspired by their quickness and resourcefulness in appreciating modulations of voice and the direction from which the sound comes. The sense is improved in quality, not in extent. The initial step in the adaptation of the recently blinded requires discrimination : the capacity, previous education, physical and mental qualities, the desire and aptitude of the man, his prospects, his endowment in patience and perseverance, and a host of other considerations must be reviewed. A hasty, morose man would be unsuitable as a masseur ; he is more likely to pass muster as a typist.

A final decision should not be arrived at until the preliminary general education is well advanced, and then he can specialize in such form of industry as seems most suitable. But in every case he must begin by mastering reading by Braille type, and that will take him eight months.

(4) Social position is a factor to consider, for the more highly educated a man is the easier will it be for him to master details and intricacies. As a teacher of the blind he is likely to succeed. Or again, if he has a capable wife to help him, poultry farming may enable him to earn a comfortable living.

In the last place, the labour market must be watched, for it is useless to train a man for a business in which competition is keen, or in which he is likely to be outstripped by those with seeing eyes. But as a general rule it may be stated that in occupations in which the blind meet those with normal sight on otherwise equal terms they can more than hold their own.

It is sometimes asked in cases of failing sight whether it is advisable for the patient to begin to adapt himself to the blindness which threatens, by learning Braille, etc. It is thought that with some small amount of sight to help him it will be easier to master the rudiments of a blind man's education. There are, however, reasons why he should not. It seldom happens in ocular disease that blindness can be certainly predicted. Blindness may be long delayed, disease may become stationary, and the patient may never require the knowledge which he proposes to acquire. If he learns anything it should be something which will be useful to him whether he sees or whether he is blind, such as typewriting. Braille is more quickly learnt by totally blind people than by those who have a little sight.

During the stage of semi-blindness depression is great, but as soon as total blindness arrives it is not unusual for sadness to give place to cheerfulness regarding the future, and to interest in the new life.

The conclusion is that the patient will have plenty of time to learn to be blind when he is blind.

Organization for the care of those whose sight has been destroyed in war is no new project, for the first hospital for blind soldiers was instituted in Paris in 1260 for the Crusaders. No educational training was attempted, and the institution was nothing more than an asylum for the board and lodging of men, handicapped it is true, but with unknown potentialities for active and useful lives. It was not until 1657 that J. Barnoulli taught a girl in Geneva by the sense of touch, and she is said to have learnt to write. Systematic training was established by Haüy in 1784, raised types being used for reading, and very soon schools for educating, and workshops for teaching trades, were established all over Europe. In England a school for the indigent blind was opened at Liverpool in 1791. Haüy's system of notation was modified by other inventors : by Gall of Edinburgh in 1827, and by Fry of London in 1837, who used Roman type. In 1836 Gall introduced the dot system. Later Dr. Moon of Brighton suggested an arbitrary method of lettering which immediately became popular and is still in use.

In 1840 the first Bible in any language was printed in English

by Alston of Glasgow, but the Roman capital letters were objected to because of the difficulty of reading them by touch.

In 1834 Braille, a blind professor of Paris, matured his dot system of arbitrary signs, but it was not until 1854, two years after his death, that it was officially adopted in Paris.

In Egypt the Koran has been printed in Braille, and the blind earn a good living by reading at public functions, funerals, etc. The system has been adapted for writing, and also a musical notation has been added.

Braille is the foundation of re-education, and the passport to the blind man's world.

In 1868 Dr. Armitage founded the British and Foreign Blind Association; and during 1872 the Royal Normal College at Norwood.

Immediately the war broke out the National Institution for the Blind and its President, Sir Arthur Pearson, set to work to establish a home for converting sightless soldiers into capable citizens, and St. Dunstan's Hostel was the result.

In an age of barbarous warfare St. Dunstan's counts as a notable triumph of civilization, and as a beacon which brightly shines in the surrounding gloom.

> Peace hath her victories
> No less renowned than war.

During the present war the method adopted in Germany with regard to the blind is to treat them as invalids as little as possible. If one or both eyes have been enucleated, artificial substitutes are fitted at the earliest possible date. The patients are placed under ophthalmic surgeons in special hospitals, and re-education is commenced as soon as health permits. They begin by learning to find their way about their own room, then in a strange room, and then out of doors. Writing, reading, and basket- and net-making follow. Music is taught, but caution is exercised lest the patient should give too much time to an art which is so largely practised by the seeing, and which is therefore likely to be unremunerative. An edition of the newspaper *Vorwärts* is printed in raised type. Nevertheless, books are confined to certain subjects, and at the central library for the blind in Hamburg there were in 1915 practically no scientific works.

In the next place, instruction is given in the use of safe machines for manufactures in order that the scholars may be fitted for industrial life. Re-education is extended over two years, and may be prolonged by payment of one mark a day. When the apprentices are finally launched upon independent life they are advised to keep in touch with their training centre.

The pension is 1368 marks (£68), and non-commissioned officers have an additional bonus of 300 marks per annum; officers receive 4000 marks per annum, with peace pay of 300 marks and more in proportion to their regular pay.

In April 1915, after six months of war, Sjögren says that there were three hundred blinded men, not including those of Saxony, Würtemburg, and Bavaria. In the whole of Germany, up to the spring of 1917, there were two thousand blinded soldiers.

## Factors Inimical to Adaptation

(1) *The Blind Man may be overwhelmed* by the realization of his position:

> He that is blind cannot forget
> The precious treasure of his eyesight lost.

But time will brighten his burden: gradually rifts will appear in the stressful clouds.

Youthful blood still flows in his veins, and former fantasies of a brilliant future will be superseded by Hope and dreams of happiness and content. He will gradually adapt himself to his surroundings, and the altered life will become more and more automatic as he learns to help himself. This self-adaptation to the ordinary routine of life will interest him; the details of feeding, of dressing, of finding his way about the house and out of doors will stimulate his self-reliance and awaken the dormant substitutes for sight. Such a man will become a worthy citizen of what W. T. Stead called the "kingdom of the blind."

(2) *Inertia* is a natural quality of some, and whilst the more active realize how "bitter a thing it is to look upon happiness through another man's eyes" the dull and the sluggish have the compensation of indifference. Others, cast in a rigid mould, lack initiative and flexibility of character. In these the pity of injudicious friends perpetuates the helplessness.

(3) *Bad Health* is naturally a great hindrance to re-education.

(4) *Age.*—The younger a man is the easier will it be for him to acquire the necessary knowledge of what S. Stephenson so aptly calls the "blind man's world."

(5) *A Small Amount of Vision.*—It is found at St. Dunstan's Hostel that those who are quite blind get on better than those having a small amount of sight. The supplementary use of this doubtful blessing is relied on, to the exclusion of the new method which is being taught, and introduces confusion and lack of concentration. In these people it might be better to occlude the eyes by a bandage during lessons.

(6) *Money.*—Perhaps one of the most potent drawbacks to the re-education and adaptation of the blind is the possession of private means or a pension sufficient to enable a blind man to exist without effort and without charity. The man, for instance, who has been a farm labourer, after becoming blind receives, it may be, 27s. 6d. a week. He returns to his home and gives his mother a part of his pension for board and spends the rest on himself. The day is passed at the cottage door, or at the bar of the public-house, and he develops into the village gossip, or it may be worse.

No one grudges a generous pension to the blind, varying in amount *according to the circumstances of the case* ; but an excessive one in the days of apprenticeship has a paralysing effect on effort and initiative. The blind should not toil in poverty ; they should not vegetate in luxury. You are not doing a kindness to a healthy man by giving him sufficient money to lead an idle life. Give him enough to oil the wheels of an active life, not enough to clog them. When education is completed, and he is starting a new life, finance him fully, and don't let him lose an opening from lack of funds. But always it is better to give independence than doles.

## Factors Favourable to Adaptation

(1) *Youth* is the plastic and molten stage of life which precedes the fixed and set period of manhood, and growth of body and mental development are still proceeding. Thought is fluid and habit immature in this formative age, and it is easy at this period to change the current of life into other channels and to adapt it to altered conditions.

(2) *Health* of body and absence of multiple injuries facilitate the inception of a new life.

(3) *Education,* in which method, precision, and observation have been well grounded, favourably aids the acquisition of new habits. In such the automatic ways of man, so well described by the late J. K. Spender, adapt themselves more readily for the benefit of the novitiate in the world of the blind.

(4) *Mental and Moral Factors.*—Hope, cheerfulness, industry, emulation and other human characteristics spur the neophyte on, and though he knows that the glowing imagery of his boyhood can never be realized, yet he bravely girds himself for the unknown journey which, almost ere begun, becomes a triumphal march to independence and happiness.

(5) *Necessity.*—A moderate income and a wife and family

stimulate a man forward, who with no hostages to fortune would fail.

(6) *Sense of Obstacle.*—Among the minor aids to adaptation may be included the very puzzling factor known as the sense of obstacle. It is thus described by Sir Arthur Pearson: "The sense of obstacle was a very interesting one; he was getting it pretty well now himself. He believed it depended on three factors—echo, difference in air-pressure, and difference in temperature. There was clearly a difference of temperature between a stone wall and the surface of an open paling; one was cold, the other was practically the same temperature as the air. If, in the open air, one was approaching a wall, much would depend, in the matter of perception, on the height of the wall. If it were higher than one's head, its presence could be detected at a greater distance than if it were only two or three feet high. Indoors, on carpeted floors, the question of echo scarcely came in at all; what was most obvious was the difference in air-pressure which was noticeable in still air, as in a house. Change of temperature was also quite definite; most things were a little warmer, or a little colder than the air surrounding them, and there was an almost indefinable change of air-pressure by which one became conscious of an object which was not discernible in any other way. The one abiding danger to blind people, in which the sense of obstacle did not apply, was a thin object, such as a door half-way open."

The last obstacle of Sir A. Pearson's list may be obviated by making doors in the blind man's house self-closing. But all aids to adaptation may fail, for there are incapables even among the blind. These must be sympathetically dealt with. Their congenital disability calls for kindness, not blame. They require every consideration, for their incapacity is an added handicap.

*Time required to learn a Trade.*—Carpentry, boot-repairing, basket-making, mat-making, etc., can be acquired in seven or eight months or a little longer; shorthand by the Braille method and typewriting in twelve months.

## Adaptation for the Loss of One Eye

A man with two perfect eyes sees two clear images of an object, but as they are focussed on the corresponding part of each retina, he does not see double, but has the advantage of seeing the object from two points of view—that is, he has stereoscopic vision. He does not see two dimensions only, as in looking at a silhouette, but also the third dimension, depth—that is, he

sees in "relief." Perfect binocular sight has to the utmost degree the following constituents :

(1) Central vision.

(2) Peripheral vision (field of vision).

(3) Relief.

(4) Colour vision.

If a man with such vision loses one of his eyes the British Pension Warrant awards him a grant of 50 per cent. Let us analyse his incapacity.

(1) Central vision is perfect, and he still sees 6/6.

(2) Peripheral vision. He has lost 1/6 of his field of vision —namely, the outer part on the injured side.

(3) Relief is lost, but may be regained, to some extent, in time. Although we are not conscious of the muscular effort which we make, when we have two eyes, in the estimation of size and position, we are conscious of the effect when we have lost one of them. For distance is ill-judged, and doing correctly without knowing that we do—in other words, automatism—is impaired.

(4) Colour-sense is perfect, and colours can be recognized as well as ever.

The principal part of a patient's loss is in the field of vision, and this will handicap him considerably in seeing on that side, especially if his work is connected with machinery in motion, or if he works on a scaffold or housetop.

It is very generally considered that the total loss of one eye only is more than compensated for by a pension of 50 per cent.

Adaptation to the altered condition, and re-education of a single eye to perform the duties hitherto carried out by both, should be undertaken early.

Whether the eye has been lost by enucleation, or whether sight has been destroyed—as, for instance, by retinal embolism—as soon as the patient is fit to be up the time has arrived for the first lesson. At the Bath War Hospital it is customary to begin with the old-fashioned game of cup and ball. This is an excellent exercise which has great educational value in teaching co-ordination and synergy of eye and hand. Other useful means are billiards, bagatelle, and work at a carpenter's bench. For out of doors tennis, golf, croquet, quoits, and bowls may be practised.

The purpose should be fully explained, and a sensible man will readily fall in with the object and pursue the treatment.

He soon begins to judge distance, an important part of orientation, but must not expect to be perfect for nine months. Sir Charles Bell has pointed out how intimate is the connexion

between the eye and the hand, for in precise action the former is the guiding and controlling spirit, the latter the executive.

*Adaptation of the Socket* to its function of retaining the artificial eye is also an early necessity. A glass shell can usually be worn a few days after an eye has been removed, and later on it gives place automatically to a permanent prosthesis. These are now brought to great perfection, and are triumphs of the simulator's art. The use of an artificial eye is of great antiquity, and Ambrose Paré tells us, "If that you have perfectly cured and healed the ulcer, you may put another eye artificially made of gold or silver, counterfeited and enamelled, so that it may seem to have the brightness or gemmy decency of the natural eye that is so lost." They probably were not such perfect imitations of nature in Paré's time as those now produced.

The omission to insert a glass shell soon after enucleation may act disadvantageously by prolonging the period of convalescence. Contractions of the socket may consequently occur, and the walls may become adherent. Operations may be necessary, and they are not always successful. From the man's point of view a permanent inability to wear a glass eye is a serious handicap in many callings, while from the country's standpoint the bonus, additional to the usual pension, which is granted in these cases will amount to a goodly sum if the pensioner's life is the proverbial long one.

### Adaptation in Relation to the Cornea and Conjunctiva

Sir Charles Bell has pointed out that the sensitiveness of the eye to foreign bodies is protective in origin.

The immediate spasm of the lids when a particle of dust touches the eyelashes prevents the invasion of flies, septic, and other foreign matter. If, however, the outer defences are pierced, and the atom reaches the eye, the exquisite discomfort produces a flow of tears which may wash away the alien invader, and if they fail to do so the pain imperatively directs attention to the necessity for removal. The cornea is more sensitive than the conjunctiva because the essential part of the visual apparatus calls for greater protection than the part of the eye which is not used for seeing. The serious consequences of absence of the defences are seen (1) in lagophthalmos (inability to close the lids), in which protection against ingress is lost, and (2) in neuropathic keratitis, in which the insensitiveness of the cornea prevents the knowledge of invasion being conveyed to the consciousness of the patient.

It is probable that without the reflex action of the lids, and

without the sensitiveness of the cornea and conjunctiva, the majority of people would be blind before they were ten years of age.

Whether *scars of the cornea* are produced by foreign bodies or by other means, the adaptive methods of nature must be supplemented by the surgeon's art in order to minimize their influence on visual function. The inconvenience produced by the dissipation of light demands attention. A dense leucoma is less disastrous than a translucent one, and not infrequently it is necessary to artificially increase the opacity by tattooing, more especially when an iridectomy has been successfully done in the neighbourhood of a sound part of the cornea. An iridectomy in these circumstances should be small, because a large one increases the radius of the circle of dissipation, which is not desirable in an artificial pupil.

An iridectomy on the nasal side of the iris is generally more useful than one on the outer side. But before operating we must find out whether the health of the patient is favourable or so deteriorated that operative interference would be likely to intensify the opacity by causing an extension of the scar.

In granting pensions in Germany for wounds of the eye the Imperial Office takes note of the probable effect of adaptation, and in addition only grants pensions to those workmen who have need of binocular sight to follow their calling.

In the following trades, among others, in which a primary pension of $33\frac{1}{3}$ per cent. is allotted, a reduction is gradually made down to 25 per cent.: tinsmiths, riveters, shipwrights, coppersmiths, blacksmiths, turners, locksmiths, agriculturists.

*Adaptation in Diplopia.*—Provided the diplopia cannot be abolished by operation on the muscles, by medical treatment or by prisms, the question of relief by other means has to be considered. *Ceteris paribus*, a diplopia in which the images are close together is one which is more disconcerting than one in which they are far apart. In a case in which a prism had been ordered for one eye only, instead of the usual plan of dividing the prism between the two eyes, the patient returned with the complaint that he could get on better by reversing the glass. The surgeon was puzzled, but the explanation was simple. By reversing the prism the false image was carried farther away from the real one and consequently did not interfere with sight. This method of disposing of the second image, however, is not usually resorted to, for it is one which might result in amblyopia of the disused eye.

Adaptation with a view to relieving a permanent diplopia is seen in the way in which a patient carries his head. It is auto-

matically turned to the paralysed side when an internal lateral muscle is affected, and away from it when an external lateral muscle is the weak one. If an elevator is functionless the head is thrown back, but when a depressor muscle is at fault the head is slightly bowed. These automatic means of relieving diplopia may be supplemented and aided by the patient. With lateral diplopia, in sitting at table he should choose his seat towards the end, so that his active muscles are on the same side as his friends are placed. At church or at the theatre he sits on the appropriate side. If an elevator muscle is paralysed he chooses his seat in the gallery ; if a depressor, in the body of the church, or in the stalls or pit of the theatre. Out of doors, at a race meeting, or at a cricket match the object is obtained by similar means. A lady in walking down a street, and wishing to look at the shop windows in passing, will take the side according to her disability, and return on the other. A man, perhaps, may prefer to avoid seeing the kerb doubled.

Small points, such as these, make much difference in the comfort of walking, but they only apply to those cases of diplopia which cannot be relieved by medical, surgical, or other orthopædic measures.

## CHAPTER XXIX

# INJURIES OF THE EAR

Intonuere poli et crebris micat ignibus æther
Præsentemque viris intentant omnia mortem.
VIRGIL, *Æneid* i, 20

THE world, mute with horror, hungering for expression, bides as yet the Olympian bard who in some immortal epic shall sense the atmosphere of a modern battlefield. Irresistibly one recalls the terse sonorous lines of the Augustan poet, and with what imaginative insight, almost prophetic, he conjures up the awe-inspiring *milieu*—though unknown to him the deafening bomb or shell, the crash of barrage-fire—*O fortunatus nimium!*

"Full of sound and fury" these Titanic battle-grounds, and how torturing and noxious the unceasing din and jar for the sensitive organ of hearing—the rude concussions riving tympanic membranes and rifling its inmost recesses. Not ephemeral either, these malign effects, for, says Sohier Bryant, in no less than 80 per cent. of ear lesions in the French army there results an impairment of hearing sufficient to disable the victim permanently for his vocation in peace-time.

In light of this, well may we speak of the "Otology of Warfare," for assuredly a new pathology has arisen. How clarified our knowledge of labyrinthine concussion, and how much more enlightened our conceptions of the functional disorders of hearing! Lastly, not only in the excitation of ear lesions has the Great War been calamitously prolific, but in its almost invariable aggravation of aural disorders of ancient standing.

## Varieties of Ear Lesions

The aural disorders of war, according to Bourgeois and Sourdille, may fall into two main groups: (i) traumatic, and (ii) non-traumatic. The former are divisible into (1) Wounds of the *external ear*—the auricle and external auditory meatus; (2) Injuries of the tympanic membrane and its cavity; (3) Wounds in the auriculo-mastoid region; (4) *War deafness* due to (*a*) *Labyrinthine concussion* from direct violence to cranium; (*b*) *Labyrinthine concussion* from explosions; (*c*) Lesions of the *auditory nerve tracts*; (*d*) *Psychogenic* causes.

(ii) *Non-traumatic otitis* including (*a*) *external otitis ;* (*b*) *acute suppurative median otitis ;* (*c*) *chronic suppurative median otitis.*

## Ætiology and Prognosis

### *Wounds of the External and Middle Ear*

The bursting of a grenade is usually responsible for wounds of the *external auricle,* which are fairly common though rarely isolated. Generally they are associated with multiple wounds of the face and scalp of superficial nature.

Injuries of the *middle ear* are of frequent incidence, notably ruptures of the tympanic membrane. The *absolute* frequency of these, like wounds of the auricle, is difficult to estimate. This for divers reasons. The pre-existing state of the membrane is often difficult to ascertain, and doubtless many instances, because of their frequent association with other and graver wounds, often pass unrecognized. While of course we have to reckon with the erroneous attribution to trauma of exacerbations of ancient otorrhœas. Out of a total of 6171 patients examined by the above authorities in eighteen months at an oto-laryngological centre in the interior, 373 cases of *traumatic median otitis* were elicited. The determining cause is shock to the tympanic membrane, variously attributed to *direct compression,* or *aspiration* with *diminution of the atmospheric pressure.* The majority of localized injuries of the membrane are due to this so-called "air projectile." Those produced by a solid missile—a bullet or shell fragment—are very rare.

The lesions may be *unilateral* or *bilateral,* and in their after history may pursue an *aseptic* or *septic* course. The former may be associated with labyrinthine lesions when the resulting deafness and auditory paræsthesiæ are of more severe grade. The *prognosis* in these aseptic forms is relatively bright, though the degree of functional restoration is dominated by the site and size of the rent, and more important by the condition of the labyrinth, whether affected or unaffected. The *septic* forms display a virulency unknown in those of civil life. Their *prognosis* is incomparably worse. Healing is deficient, and their duration through the liability to recurrences indefinite.

### *Wounds in the Auriculo-Mastoid Region*

These are rare, always due to a solid projectile, and their almost invariable association with grave cranial lesions, usually followed by death, accounts for the fact that Bourgeois and Sourdille, out of 700 cases at the Limoges Centre, found only

12 examples of auriculo-mastoid wounds. The *prognosis*—given proper treatment and no cranial and meningeal complications—is relatively bright, but, unfortunately, from a *functional* point of view sombre, owing to the liability of *laybrinthine* complications, the deafness in such instances being generally permanent.

*Labyrinthine Concussion from Direct Violence to Cranium*

It is usually due to a bullet or shell-splinter impinging on the cranium perpendicularly or tangentially. The degree of damage suffered by the labyrinth depends on the *velocity* and *massiveness* of the projectile and its site of impact on the cranial or facial bones. Those impinging on the *mastoid* region are a prolific source of damage to the internal ear. According to Lannois and Chavanne, involvement of the labyrinth is rare in *frontal* lesions, but common according to Chatelin in *occipital* and *temporo-parietal* injuries. In three instances, according to Bourgeois and Sourdille, labyrinthine trouble followed injuries of the *temporo-maxillary* region. Lastly, it is interesting to note that no labyrinthine lesions follow when the projectile involves only the *soft* parts.

Coming to more exact statistics, Lannois and Chavanne state that out of thirty-eight mastoid lesions, hearing was annihilated in 73, and partially lost in 21 per cent., while in Bourgeois' series of similar injuries it was almost identical—viz. 60 per cent. total, and 33 per cent. partial deafness. Lannois and Chavanne state that deafness is common if the branches of the facial nerve distributed to the ear are implicated, but the same is rare in fractures of the cranial vault. They emphasize the point that, given no direct traumatism, labyrinthine concussion was only exceptionally followed by deafness.

The *course* and *prognosis* of these cases is, as might be expected, very gloomy. The associated disorders of *equilibrium* may ultimately pass away, and according to Chatelin the vertiginous symptoms "generally decrease by degrees, and finish by disappearing completely." As to *audition*, the deafness when *total* is incurable, but if partial admits of improvement.

*Labyrinthine Concussion from Explosions*

Our views as to the nature of the deafness occasioned thereby have since the onset of war undergone radical revolution. At first attributed by the bulk of aurists to implication of the *internal* ear, and consequently incurable, the researches of Sicard and Gault revealed their purely *functional* nature and their favourable response to *psychotherapy*.

The manner in which dissipation of the fallacy was achieved is so interesting that it merits a brief allusion. Gault, his attention arrested by the frequency of *total* deafness in men arriving at the Centres of the Interior, migrated to the Front to pursue his investigations. Here, out of 600 men examined *immediately* after explosive bombardment, he found only *one* deaf subject. Thereupon he conducted some experiments with, as their basis, the *cochleo-palpebral reflex*. The results of his investigation led him to the important conclusion that a large number of these cases were *psychogenic*. This radical change in conception of the nature and treatment required for such cases was strikingly reflected in another military sphere—viz. the number of applicants for *discharge* and *pension on account of deafness* underwent marked *diminution*. Hence the true meaning of the following passage quoted from Duco and Blum's work : " The number of wounded complaining of deafness is considerable. Frequent as applications for pensions were at the beginning of hostilities, they have now become correspondingly infrequent, without, on the other hand, any diminution in the number of cases subjected to examination."

The deafness in these cases may be *transitory*, or it may persist in *partial* form for some months. *Total bilateral* deafness is happily very rare, but total loss of hearing in *one* ear is fairly common—noted in six out of thirty cases of concussion (Bourgeois and Sourdille). A noteworthy feature of these cases of partial deafness is the presence of *hyperacusis*. Hurst on this point remarks that in war neuroses the *auditory motor* or *Jump-Reflex* is *exaggerated*. In other words, " a sudden noise normally causes an individual to jump and blink : at the same time his pupils dilate. The jump, at any rate, is a protective reflex, and represents a preparation for fight or flight. The motor part of the reflex is sub-cortical. In war neuroses in which the reflex is exaggerated, jumping occurs during sleep and hypnosis, although the patient does not hear the noise which produces it. The reflex is abolished in complete hysterical deafness, so it must occur above the synapses, which are unswitched in this condition." Hurst, therefore, on this basis, is inclined to think " that the reflex centre is in the posterior corpus quadrigeminum or medial corpus geniculatum, and the close relation of these centres to the blinking and sympathetic pupillo-dilator centre affords an anatomical ground for holding this view." He considers, therefore, " that the very common exaggeration of this reflex in soldiers, the victims of war neuroses, is not correctly described as hyperacusis. Actual hearing need not take place as the reflex occurs when they are asleep and hypnotized. It is simply an exaggeration of the defensive reflexes."

We are here provided with a reasonable explanation of the paradoxical behaviour of these subjects, who *though deaf dread noise* because of the *hyperæsthesia* of their *auditory centres*. However, in regard to the *prognosis* of these cases, it would be well for the assessor to take the guarded view of Bourgeois and Sourdille. Thus they observe : " It is premature as yet to predict the future in this form of deafness. A longer period is necessary before we can eliminate with more confidence the share taken by purely functional disturbances. It is recognized, however, that these deafnesses of warfare in the severe or bilateral form are exceptional, and that the others improve frequently and very decidedly."

It is well also to be alive to our responsibilities in this sphere, in the matter of *differential diagnosis*. The necessity of their distinction from the deafness of *otitis media* need hardly be emphasized. Far more important is it that we should realize the tendency on the part of these subjects to impute *consciously* or *unconsciously* all their aural disorders to *recent* events. Their statements should be accepted with reserve, and equally essential is it that our interrogations should not be of the nature of leading questions. Apart from the exclusion of *syphilitic* deafness we have to differentiate between *labyrinthine* and *functional* types of deafness, a fertile source of confusion : while of course we should not overlook the possibility of frank *simulation*.

### *Deafness from Lesions of the Auditory Nerve Tracts*

Labyrinthine varieties of deafness are the outcome of *peripheral* lesions of the auditory *percipient mechanism*, its nerve-endings, whereas in the form now under review, the sensory paralysis affects the *cochlear* and *vestibular* branches, and thus *deafness in these cases coexists with loss of Barany's reflexes*.

As to its *ætiology*, fractures of the *petrous* bone and the direct impact of projectiles on the *cranium* figure largely. This particular form of deafness derives its distinctiveness, not from the lesions that transpire in the auditory nerve tracts, but from those occasioned by coincident implication of *other nerve tracts*—viz. involvement of the *facial nerve* in its passage through the posterior cranial fossa and internal auditory meatus. There may be also, as Lannois and Chavanne have pointed out, a clinical syndrome, in which deafness is complicated by symptoms indicative of involvement of the *fifth*, the *facial*, and *ocular* nerves. A deafness of this origin, too, may be associated with symptoms suggestive of a *cerebral*, *cerebellar*, or *bulbar* tumour.

In short, the symptoms here may be protean in character.

Fortunately these forms of deafness are very exceptional, and obviously cannot take the form of complete loss of hearing unless the lesions are *symmetrical.* In the majority of instances " cerebral deafness " is generally *hysterical* or *labyrinthine.*

In truth, the data we possess regarding the symptomatology of this type of deafness is largely derived from the collateral studies of the effects of *tumours* at different sites. There is very little information forthcoming from the war of so-called *cerebral* deafness due to lesions, cortical or other, in localization. It is obviously, as before indicated, difficult to exclude the *functional* element when deafness appears in a medley of vague cerebral phenomena, especially as in the reported cases many are complicated by amnesia, mental hebetude, and confusion.

### *Psychogenic Deafness*

The unprecedented violence of modern gun-fire, the terrific atmospheric commotion induced, its prolongation beyond the limits of human endurance, and its association with horrifying spectacles, what circumstances more calculated to excite a profound nerve cataclysm ! Consider these also as all acting on men taxed to the utmost by mental and moral anguish, and no less physical fatigue, and what marvel that the passage of neuron impulses from the higher cortical cells to the periphery undergoes suspension—function abrogated for a variable period !

No trace of peripheral organic lesion is demonstrable, yet deafness like " a bolt from the blue " has descended on them : and who can doubt that it is upon the higher centres that the brunt of the outrage has fallen. The more massive the explosion, the more overwhelming its detonation, the more likely is functional deafness to ensue. Hence its frequent incidence in men in contiguity to bursting shells of high explosive calibre, and especially mines. The frequently associated burial of the man himself or his comrades intensifies the emotional horror. The momentary deafness, the natural result of the explosion, how potent its effect on the mind of the dazed and often terrified soldier ! He stands defenceless against autosuggestion, and, convinced that he is *permanently* deafened, he *becomes actually so* !

This functional form of deafness may display itself as (*a*) *deaf-mutism ;* (*b*) *total deafness ;* or (*c*) *extreme dullness of hearing.* The *prognosis* of deaf-mutism is favourable, cure almost always ensuing swiftly under appropriate psychotherapy. As for the other two varieties, the outlook is most variable. The personal equation of the individual is a prime factor, his intellectual and moral calibre, the high or low grade of the emotional concomitants,

the atmosphere of his environment, and the propriety of the modes of suggestion enlisted. Much, too, depends on the length of the period that has elapsed since the onset of the deafness, whether he has been the subject of ill-advised pity, or equally ill-advised and fruitless local treatment. In that event the outlook is pitiable, as Bourgeois and Sourdille remark: "He becomes a pithiatic and a simulator, simulation being superadded in an indefinable proportion: but inasmuch as they are pithiatics they are patients who must only be returned to the Army when they are cured: their commanders can make no use of them, and their remaining inactive in the depots is a nuisance from every point of view."

## Method of Investigating Case

When confronted with a case of deafness coming up for *pension* for compensation, the following plan should be adopted. The history should be analysed, a search made to ascertain the presence or absence of morbid anatomical changes, and, lastly, exact testing of the aural capacity is requisite.

### *Analysis of Previous History*

If young, the deafness may be *congenital*—if old, *senile*. In regard of *past illnesses*, most significance attaches to *acute specific fevers* (scarlatina, syphilis, etc.), *meningitis*, and any symptoms suggestive of *adenoids*. *Trauma* also must not be overlooked, and in this connexion the previous profession must be taken into consideration. If it were one requiring acute hearing it would be presumptive evidence that the man's ears were sound on enlistment. On the other hand, deafness may be said to be incidental to certain occupations—gunners, factory workers, coppersmiths, etc. To elicit this latter point is important, this because the *pre-existing* difficulty of hearing may be falsely attributed to the alleged trauma. The soldier may impute his deafness to an accident of war, or the worker saddle an "industrial accident" therewith, whereas in truth the alleged casualty may be merely the *occasion of the detection* of the deafness, not the cause of its production.

Much may be gleaned from the manner in which the patient narrates the onset and course of his symptoms. Alike in soldier and industrial worker it will be suggestive of simulation if he says it came on *suddenly* and yet vouchsafes no history of *injury*, *syphilis*, or *acute intracranial* lesions, and if no accumulation of wax be ascertained. Apart from these, deafness in general ensues *gradually*. One may be suspicious, too, if a man alleges

*total* deafness as opposed to mere difficulty or hardness of hearing, the latter being much the more common both in military and civil spheres. In cases in which *accident* is alleged, the circumstances thereof must be closely scrutinized.

### *Analysis of Alleged Casualty*

One cannot have too much detail, one can easily have too little of an alleged casualty. What was he doing at the time ? How and when did it occur, and how did it affect him ? What was his attitude at the moment ? Thus in a soldier alleging deafness in sequence to an explosion, the loss of hearing according to Bourgeois and Sourdille is generally " more pronounced in the ear facing towards the projectile." Again, we should note the *immediate* consequences. Did he lose consciousness, become completely deaf, lose his memory, or did blood flow from his ear ? Was he placed *hors de combat* or able to resume duty after a brief interval ? The above authorities on these points remark : " The word ' vertigo ' should never be mentioned, but we ask the injured man how he got up, how he arrived at the aid post, if he was able to walk alone directly afterwards and during the following few days, if he had nausea and vomiting ; we inquire as to when the discharge from the ear commenced, as to its nature, its quantity, and the treatment employed."

If the answers given are vague, pin him as far as possible to definite statements. Especially in case of " accident " is categorical information desirable. Test the truth of answers by their *congruity* or *incongruity* with the history, character, and course of the alleged accident and aural disorder. Do not appear to attach outstanding importance to any particular symptom. It suggests *exaggeration*. Avoid any statement that may be construed as implying an *unfavourable prognosis*. Be mindful of the *suggestibility* and tendency to depression these hystero-pithiatic subjects possess. Lastly, but most important, view all answers in light of the man's military documents and reports, special or other, noting also, of course, any reference to aural disorders or lesions.

### *Direct Aural Examination*

Needless to say this must be most thorough and searching, and calls for expert knowledge, whether it be the responsibility of the State or the employer that be at stake. The *site* and *nature* of *anatomical* lesions, if present, must be exactly determined. The *organic* or *functional* nature of the disorder must be established, or whether it be a combination of both. Though

these are inevitably the groundwork of any decision, it falls without the scope of this work to discuss their differential diagnosis or to describe the various *tests for aural capacity*. It is, of course, particularly the duty of the assessor to satisfy himself as to the reality, the *actual existence* of *loss* or *diminution* of auditory power, as also in the latter instance the measure thereof. But for detailed information on the foregoing points he must consult special works on the subject.

But apart from this, inasmuch as the responsibility of the State or individual employer is concerned, it falls to his lot to decide the following questions: (1) Is the deafness the result of the casualty or accident? (2) Did the deafness pre-exist? (3) Did the accident aggravate an existing deafness?

(1) *Is Deafness the Result of the Casualty or Accident?*

In all cases of deafness attributable to accident the importance of early examination in sequence thereto is obvious. Deafness due to *labyrinthine concussion* may follow loud noises, explosions, locomotive shrieks, etc., while its ætiology in war injuries has been sufficiently dilated on. In *compensation* cases, for the responsibility of the employer to be admitted it is generally necessary that the deafness supervene *instantaneously*. For the professional deafness, e.g. of boilermakers, stokers, blacksmiths, miners, coopers, millers, etc., is not regarded as an "industrial accident." *Auditory hyperæsthesia* may also be referred to an industrial accident. But in such cases certain sounds only, which vividly recall the accident, prove intolerable. *Tinnitus aurium* also may be attributed to *accident*, and here again the detection of inconsistencies will be our chief weapon. Thus such surging in the ears is more obvious during silence, more troublesome in the night time than in the morning, and diminished in the presence of external noises. Clearly if a man be coached in these peculiarities he may for long elude detection.

*External and Middle Ear Lesions.*—These will scarcely create much difficulty if of recent origin; but one should recall that a blow on the chin, a fracture of the base of the skull, may indirectly damage the auditory apparatus. Myringitis has followed the syringing of the external auditory canal or the impact of a current of air. Bourgeois and Sourdille remark that in war injuries of the tympanic membrane, the most frequent sources of infection are "medicated lotions and inopportune instillation of ear drops" given with the best of intentions to wounded soldiers on arrival at the aid posts.

*Rupture* of the *tympanum* without pain or hæmorrhage may

be produced by both *direct* and *indirect* violence—explosions, sudden compression, or decompression. But the all-important differentiation both in civil and in military cases is that between *recent* and *ancient* lesions.

Before proceeding to effect their distinction it may be noted that in simple *concussion* of the tympanic membrane, when recent, sometimes ecchymoses may be detected therein.

*Recent Rupture.*—If seen within two or three days its margins are ragged and of dark colour through extravasation of blood. Short of this there will be noted marked congestion of the vessels coursing along the malleus and its processus brevis, while the tympanic mucous membrane appears yellow in colour.

If of *long standing*, the margins, on the contrary, are thickened and less irregular, while the tympanic membrane is reddened from hyperæmia or distended vessels. *Calcification* of the margins, according to Sand, will indicate that the rupture is over three weeks old. Moller states that inflation of the Eustachian tubes in perforations due to *chronic disease* produces a shrill and intense souffle, but a low and feeble souffle in perforations of *traumatic* origin.

The foregoing will be of value in enabling us both in industrial accidents and war injuries to differentiate recent from ancient aural lesions.

(2) *Did the Deafness Pre-exist?*

The frequency with which total *unilateral* deafness is discovered by pure chance is a matter for marvel. Small wonder, therefore, that in the introspective period that follows an accident, with its impending pension or compensation, a man should first become aware of a disability—in truth of *long standing*. Clearly a claim for pension or compensation under such circumstances need not necessarily be *fraudulent*, as the man may be ignorant that his deafness *pre-existed*. On the other hand, we must not be too ready to assume absence of fraudulent intent, as not infrequently soldiers or industrial workers—sufferers from aural suppuration—falsely impute such to an accident of long subsequent date. Thus to quote not an infrequent occurrence, according to Bourgeois and Sourdille: "A man is injured in the limbs; he is discharged on an ambulance with a paper mentioning this injury exclusively; he passes through several hospitals without one report mentioning a lesion of the ear; he decides eventually to complain of deafness, which he attributes to an explosion; you examine him; you ascertain old lesions, and you can affirm almost positively that his history is false from beginning to end."

Now as to the means of detecting such attempts at imposition, and, generally speaking, the decision required is whether a *purulent otitis media* is of *recent* or *ancient* date. In the latter event the strong and penetrating odour of the pus, the destruction of tissue, and the grey sclerosed colour of the tympanum will bespeak its age. Again, Bourgeois and Sourdille emphasize the difficulty of distinguishing between *non-infected* and *infected* perforations, and suggest their differentiation on the following grounds. In the former the surrounding parts are normal. In the latter, " if infected and complicated by profuse suppuration which pulsates it is difficult to distinguish it from an ordinary *acute otitis*. When seen after several months it cannot in any way be differentiated from a *chronic suppuration* or *cicatricial otitis*. There are, however, numerous cases in which the old-standing pathological nature of the otitis is indisputable."

Also in *war injuries* we have to distinguish between recent simple *driving in* of the membrane by an " air projectile " and the depression and pathological retractions associated with *old tubotympanic catarrh*. Thus, according to the above authorities, in the latter the following appearances are typical. Retraction and horizontal inclination of the handle of the malleus and projection of the anterior and posterior folds of the promontory are to be noted with concomitant naso-pharyngeal lesions. Even without retraction the membrane becomes dark and lustreless, and may exhibit calcification or atrophic or hypertrophic zones. They remark that " these lesions, indicative of old standing sclerosis of the tympanum, are easy to differentiate, but we cannot always distinguish between a cicatrix of a few months' duration due to the war and an older pathological condition."

But, again, we have to recollect that a *sclerosing* otitis media is, according to Chauvel (1892), often of *traumatic* origin. Such affections may follow blows or falls on the head or chin, shell explosions, or violent noises of any description. A traumatic origin for such troubles should, he thinks, be conceded if the deafness were *unilateral*; but in persons upward of forty-five years of age, trauma as a cause should be accepted with reserve.

*Difficulty of Hearing*.—This may be occasioned by an accident, and yet without its being recognized or appreciated by the person himself. In such event it may be that only when other phenomena—*giddiness, attacks of vomiting, tinnitus aurium*—supervene later does the subject seek professional advice, and then only in regard to these particular symptoms, not to deafness. His giddiness, unless of high grade, he may ignore; his nausea or vomiting, too, he may refer to a disordered stomach—ignorant of the fact that these, like the tinnitus aurium, are due to *vestibular*

*irritation* consequent on trauma. Only on examination is his *deafness* detected, and doubtless in some instances persons have failed to obtain compensation due to them as the result of an "industrial accident."

Ménière's disease may follow fracture of the petrous bone, surgical lesions of the semicircular canal, any accident that provokes labyrinthine concussion, or it may follow decompression, detonations, etc. Also *injury* may produce an *infective* labyrinthine inflammation with secondary Ménière's disease; or, as Frankl Hochwart (1905) points out—in a person the subject of *pre-existing* aural disease—trauma may provoke the onset of this syndrome. But in persons of middle age and upwards, the imputation of Ménière's disease to accident should not be accepted too readily. For at necropsy such subjects have sometimes exhibited *atheroma* of the vessels supplying the inner ear. It is well to remember also that the symptoms of this syndrome may appear in *hysteria*, be a complication of *traumatic neurasthenia*, or represent the *aura* of an *epileptic* attack. Needless to say, in all the former aural affections, the question of *pension* or *compensation* will only arise when their onset is the outcome of conditions constituting an "accident of war" or an "industrial accident."

(3) *Did the Accident aggravate a Pre-existing Deafness?*

This question not infrequently comes up for decision, especially in *soldiers*. But it must be conceded that experience clearly shows that given *pre-existing aural disease* the chance of a *diminution* or *abolition* of hearing powers through *direct cranial injury* or *concussion* is much increased. Lannois and Chavanne, basing their study on 1000 cases, noted that men suffering from *chronic suppurative otitis media* or well-marked *oto-sclerosis* after commotion of the labyrinth by the bursting of shells showed a greater proportion of deafness or impaired hearing than healthy subjects. On the other hand, Got's experience differs. He states that soldiers enlisting with healthy ears are more often injured in their labyrinth than those whose ears were defective on enrolment. He cites the following statistics: *traumatic labyrinthitis* without objective lesions of the middle ear, 50·88 per cent; *traumatic labyrinthitis* with defects of the middle ear arising at the same time as the disturbance, 26 per cent.; *traumatic labyrinthitis* with defects of the middle ear antecedent to the ear, 24 per cent.

But in keeping with Lannois and Chavanne, Canuyt states: "In the majority of soldiers who came back from the Front with material lesions of the hearing apparatus, the ear was not sound before the war. This statement is based on observations made

in 8000 cases up to April 1916. They had suffered from old suppuration; from unhealthy drumheads, with or without perforation; from cicatricial otitis with fibrous synechiæ; from fungous, sclerous, or adhesive otitis; or the ear, and in particular the tympanum, had been ill-ventilated. In a considerable number of those examined, the permeability of the nose and Eustachian tubes was diminished by obstructions, such as spurs, hypertrophy of the turbinate bones, deviation and thickening of the septum, and large adenoids."

It will be seen then that the evidence at present forthcoming is—given trauma, etc.—preponderatingly in favour of the auditory function being depreciated in the presence of *pre-existing* aural lesions.

### Factors in Evaluation

Having established a causal relationship between the "casualty of war" or "industrial accident" and the resultant deafness, the assessor has but to determine the degree to which the *auditory functions* have been impaired, and of gauging the intensity of any associated *vertigo*. Aurists compared with oculists labour under far greater disabilities in this respect. They cannot translate in arithmetical terms the degrees of deafness. Perforce they have to rest content with adjectival qualifications such as *total* or *partial*, or in the case of the latter they may differentiate between extreme, moderate, or slight degrees of deafness. Bourgeois and Sourdille for themselves observe: "We would willingly accept our colleague Molinie's proposition—namely, that aurists should concur in defining the limitations in identical grades of deafness in accordance with their capacity for hearing the human voice." They suggest as a basis Schwartze's classification formulated according to the distance at which the ordinary conversational voice is perceptible—below 1 metre; between 1 and 5 metres; between 5 and 10 metres; between 10 and 20 metres.

They hold it unadvisable that we hazard too exact prognoses, though it would be legitimate to regard as *ameliorable* all conditions of deafness associated with *normal reflexes*. On the contrary, in all cases in which these responses are *absent* our forecast should be more guarded. In purely *functional* disorders of inveterate type they counsel prolonged observation with, moreover, a searching examination by an expert.

The essential point for the assessor is the determination of the degree of *auditory* capacity. This again in the case of an *industrial worker* should be viewed from the aspect of his vocation—his earning capacity. Some occupations are compatible with *total* deafness, whereas in others, deafness, even if only *partial*, is tanta-

mount to total loss of hearing. Thus a navvy working on a railway or a miner if distinctly hard of hearing would be clearly as much exposed to the danger of accident as a man totally deaf. The object of compensation has, of course, for its end the reparation of the *economic* loss of the victim, for which reason obviously the man's occupation must be taken into account.

On the contrary, *military* law, unlike civil law, takes no cognizance of the *injured soldier's occupation*. Does he merit discharge or not? Or is his degree of deafness compatible with *combatant* service—or if not, does it indicate his relegation to the *auxiliary* branches, such, of course, as he may still be eligible for.

### *Assessment*

An industrial worker may lose his *auricle*, but as his hearing is unimpaired thereby, his *earning capacity* is therefore uncompromised and, strictly speaking, he is not eligible for compensation. Still, the Vienna Scheme does admit an incapacity of 8 per cent. and Ropke 10 to 15 per cent. These figures are also adopted for loss of the auricle by the French "Guide Barème."

### *Unilateral Lesions*

In all cases coming up for pension or compensation it must be realized that the ear, like the eye, is a *dual* organ. In *unilateral* affections of the ear, therefore, the loss or deficiency of function in the *one* may be compensated for by the intact twin organ.

*Unilateral Hardness of Hearing.*—The following are the estimates of German legislation. According to Ropke they range from 10 to 40 per cent. Passow places them at from 10 to 30 per cent., but Imbert, the French expert, considers these figures as obviously too high, and would rate the incapacity at not higher than from 8 to 10 per cent. The French "Guide Barème" adopts a flat rate of 10 per cent.

*Unilateral Deafness.*—Generally speaking, in *compensation* cases *unilateral* deafness, if only slight, is not compensated. The following are the civil estimates by Continental tribunals in cases in which the faculty of hearing is suppressed on *one* side only—a postulate which can only be of limited application:

| | Per cent. |
|---|---|
| Wiener Schema | 8 |
| Passow | 15–30 |
| Italian legislation | 10 |
| Swedish legislation | 10 |
| Finnish legislation | 0–10 |
| Le Jurisclasseur (French Jurisprudence) | 4–22 |
| Imbert | 10–15 |
| Remy | 0–10 |

The French "Guide Barème" lays down the following:

| | Per cent. |
|---|---|
| *Unilateral* deafness *without* tinnitus or vertigo | 10–15 |
| „ „ *with* tinnitus or vertigo | 30 |

The same authority in chronic purulent otorrhœa assesses the resultant incapacity at from 20 to 50 per cent. This because the victim is subject to grave complications and his hearing is nearly always impaired, sometimes irremediably so.

### *Bilateral Lesions*

The findings of civil tribunals relate to two types of cases.

*Bilateral Hardness of Hearing.*—When *slight* the "Wiener Schema" admits no incapacity, but in cases of average type (what constitutes the average ?) 0–8 per cent.

Schwartze more discriminatingly admits 5 to 22 per cent. according to the case under review. The findings of German legislation vary from 20 to 30 per cent., and Imbert, the French expert, in instances in which hearing is seriously affected, considers that to submit an average incapacity of 10 to 15 per cent. appears equitable.

The French "Guide Barème," for *hardness of hearing* of *both ears*, assesses the incapacity at 10 to 15 per cent.

*Hardness of Hearing of one Ear, and Deafness of the Other.*—German legislation admits an incapacity of 30 to 40 per cent., figures which Imbert again considers too high, and accordingly suggests their reduction to 25 and 30 per cent.

The French "Guide Barème" assesses the incapacity in these cases at 25 to 30 per cent.

*Bilateral Deafness.*—In civil tribunals the following are the recorded estimates of the resultant incapacity:

| | Per cent. |
|---|---|
| German legislation | 15–50 |
| Schwartze | 30–50 and 100 |
| Wiener Schema | 50–75 |
| Austrian Imperial Office | 45 |
| Becker | 50 |
| Italian legislation | 40 |
| Finnish legislation | 50 |
| Swedish legislation | 50 |

It will be seen that all these numbers oscillate about 50 per cent., and French experts show no sensible disparity therefrom:

| | Per cent. |
|---|---|
| Brouardel | 40 |
| Remy | 10–50 |
| Ollive and Le Meignen | 50–60 |
| Imbert | average estimate 50 |

Turning now to *military* estimates, the French "Guide Barème" rates the degree of disablement in *bilateral deafness* at 50 per cent.

In our own Schedule of Specific Injuries total deafness is rated at 70 per cent., and the following figures are adduced by Major Dundas Grant, R.A.M.C.(T.), president of the Special Aural Board under the Ministry of Pensions. This provisional scale was drawn up by him in order to attain an approximate uniformity of assessment in these cases.

Before passing thereto we would remark that given *pre-existing* disease of the ear, if the man was originally passed for service and his hearing becomes hereafter incompatible therewith, the Board assumes his disability to be attributable to, or at all events aggravated by, military service. This, of course, only if there be an absence of any other obvious cause.

| | Percentage of total disablement awarded |
|---|---|
| (1) Total deafness in both ears | 70 |
| (2) Total one, nearly total other (shout close to ear) | 60 |
| (3) Extreme both (shout from 1 to 2 feet off on both sides) | 50 |
| (4) Total one, moderate other (loud voice 9 feet off) | 40 |
| (5) Extreme one, moderate other | 30 |
| (6) Total one, normal other | 20 |
| (7) Moderate, both or either * | under 20 |
| (8) Incapacitating vertigo | 50–60 |

Major Grant remarks that each case of "incapacitating" vertigo should be taken on its merits in the light of the frequency, severity, and genuineness of the attacks.

* Gratuity.

# ADDENDUM

## VARIOUS TABLES OF EVALUATION

**United States Pension Scheme. Brouardel's Tables of Evaluation: Upper Limb; Lower Limb. Remy's Tables of Evaluation: Amputations or Disarticulations of the Hand; Ankyloses of the Hand; Deformities of the Hand**

### UNITED STATES PENSION RATES

*Rates and Disabilities specified by Law*

| | Dollars per month |
|---|---|
| Loss of both hands | 100·00 |
| Loss of both feet | 100·00 |
| Loss of both eyes | 100·00 |
| Loss of an eye; the other lost before enlistment | 100·00 |
| Regular aid and attendance (first grade) | 72·00 |
| Total disability in both hands | 72·00 |
| Loss of one hand and one foot | 60·00 |
| Total disability in one hand and one foot | 60·00 |
| Amputation at shoulder or hip joint, or so near joint as to prevent use of artificial limb | 55·00 |
| Frequent aid and attendance | 50·00 |
| Total disability of arm or leg | 46·00 |
| Amputation at or above elbow or knee | 46·00 |
| Loss of a hand or a foot | 40·00 |
| Total disability of one hand or one foot | 40·00 |
| Total deafness | 40·00 |
| Inability to perform manual labour (second grade) | 30·00 |
| Disability equivalent to loss of hand or foot (third grade) | 24·00 |

*Table of Rates fixed by the Commissioner of Pensions for certain Disabilities not specified by Law*

| | Dollars per month |
|---|---|
| Ankylosis of shoulder | 12·00 |
| Ankylosis of elbow | 10·00 |
| Ankylosis of knee | 10·00 |
| Ankylosis of ankle | 8·00 |
| Ankylosis of wrist | 8·00 |
| Loss of sight of one eye | 12·00 |

*Table of Rates fixed by the Commissioner of Pensions for certain Disabilities not specified by Law*—continued

| | Dollars per month |
|---|---|
| Loss of one eye | 17·00 |
| Nearly total deafness of one ear | 6·00 |
| Total deafness of one ear | 10·00 |
| Slight deafness of both ears | 6·00 |
| Severe deafness of one ear and slight of the other | 10·00 |
| Nearly total deafness of one ear and slight of the other | 15·00 |
| Total deafness of one ear and slight of the other | 20·00 |
| Severe deafness of both ears | 22·00 |
| Total deafness of one ear and severe of the other | 25·00 |
| Deafness of both ears existing in a degree nearly total | 27·00 |
| Loss of palm of hand and all the fingers, the thumb remaining | 17·00 |
| Loss of thumb, index, middle, and ring fingers | 17·00 |
| Loss of thumb, index, and middle fingers | 16·00 |
| Loss of thumb and index finger | 12·00 |
| Loss of thumb and little finger | 10·00 |
| Loss of thumb, index, and little fingers | 16·00 |
| Loss of thumb | 8·00 |
| Loss of thumb and metacarpal bone | 12·00 |
| Loss of all the fingers, thumb and palm remaining | 16·00 |
| Loss of index, middle, and ring fingers | 16·00 |
| Loss of middle, ring, and little fingers | 14·00 |
| Loss of index and middle fingers | 8·00 |
| Loss of little and middle fingers | 8·00 |
| Loss of little and ring fingers | 6·00 |
| Loss of ring and middle fingers | 6·00 |
| Loss of index and little fingers | 6·00 |
| Loss of index finger | 4·00 |
| Loss of any other finger, without complications | 2·00 |
| Loss of all the toes of one foot | 10·00 |
| Loss of great, second, and third toes | 8·00 |
| Loss of great toe and metatarsal | 8·00 |
| Loss of great and second toes | 8·00 |
| Loss of great toe | 6·00 |
| Loss of any other toe and metatarsal | 6·00 |
| Loss of any other toe | 2·00 |
| Chopart's amputation of foot, with good results | 14·00 |
| Pirogoff's modification of Syme's | 17·00 |
| Inguinal hernia which passes through the external ring | 10·00 |
| Inguinal hernia which does not pass through the external ring | 6·00 |
| Double inguinal hernia, each of which passes through the external ring | 14·00 |
| Double inguinal hernia, one of which passes through the external ring and the other does not | 12·00 |
| Double inguinal hernia, neither of which passes through the external ring | 8·00 |
| Femoral hernia | 10·00 |

## BROUARDEL'S TABLE No. 1

| Permanent infirmities: 100 indicates the maximum of loss. | Day labourers. | Occupation specially requiring the use of the upper limbs. | Occupation specially requiring the use of the lower limbs. | Workers in the arts. |
|---|---|---|---|---|
| RIGHT UPPER LIMB | | | | |
| Loss of the whole limb | 70–80 | 70–80 | 50–70 | 70–90 |
| Loss of the part below the elbow | 70–80 | 70–80 | 50–60 | 70–90 |
| Loss of the hand | 60–75 | 65–75 | 45–55 | 70–90 |
| Loss of the thumb | 25–35 | 25–35 | 15–25 | 40–55 |
| Loss of the index finger | 10–15 | 10–25 | 10–15 | 25–35 |
| Loss of the middle finger | 10–15 | 10–15 | 5–10 | 15–25 |
| Loss of the ring finger | 5–10 | 5–10 | 5–10 | 15–20 |
| Loss of the little finger | 5–10 | 5–10 | 5–10 | 15–20 |
| Complete ankylosis of shoulder | 40–55 | 40–50 | 25–35 | 40–65 |
| Incomplete ankylosis of shoulder, according to degree | 10–40 | 10–40 | 10–25 | 30–40 |
| Complete ankylosis of elbow | 30–40 | 30–35 | 10–25 | 35–45 |
| Incomplete ankylosis of elbow, according to degree | 10–30 | 10–30 | 0–10 | 20–35 |
| Complete ankylosis of wrist | 20–35 | 20–30 | 5–15 | 30–45 |
| Incomplete ankylosis of wrist, according to degree | 5–20 | 5–20 | 0–5 | 10–30 |

## BROUARDEL'S TABLE No. 2

| Permanent infirmities: 100 indicates the maximum of loss. | Day labourers. | Occupation specially requiring the use of the upper limbs. | Occupation specially requiring the use of the lower limbs. | Workers in the arts. |
|---|---|---|---|---|
| LEFT UPPER LIMB | | | | |
| Loss of the whole limb . . . | 60–70 | 60–70 | 40–50 | 70–80 |
| Loss of the part below the elbow . | 60–70 | 60–70 | 40–50 | 70–80 |
| Loss of the hand . . . | 55–65 | 55–65 | 30–40 | 70–80 |
| Loss of the thumb . . . | 15–25 | 15–25 | 10–25 | 25–40 |
| Loss of index finger . . . | 5–15 | 5–15 | 5–15 | 15–25 |
| Loss of middle finger . . . | 5–10 | 5–10 | 5–10 | 15–20 |
| Loss of ring finger . . . | 5–10 | 5–10 | 0–5 | 10–15 |
| Loss of little finger . . . | 0–10 | 0–5 | 0–5 | 5–10 |
| Complete ankylosis of shoulder . | 40–50 | 30–45 | 10–25 | 35–55 |
| Incomplete ankylosis of shoulder, according to degree . . . | 10–40 | 10–30 | 0–10 | 10–35 |
| Complete ankylosis of elbow. . | 25–35 | 25–35 | 5–15 | 25–40 |
| Incomplete ankylosis of elbow, according to degree . . . | 5–25 | 5–25 | 0–5 | 10–25 |
| Complete ankylosis of wrist . . | 15–20 | 15–20 | 5–10 | 20–30 |
| Incomplete ankylosis of wrist, according to degree . . . | 5–15 | 5–15 | 0–5 | 5–20 |

## BROUARDEL'S TABLE No. 3

| Permanent infirmities : 100 indicates the maximum of loss. | Day labourers. | Occupation specially requiring the use of the upper limbs. | Occupation specially requiring the use of the lower limbs. | Workers in the arts. |
|---|---|---|---|---|
| LOWER LIMBS | | | | |
| Loss of the whole limb | 50–75 | 50–75 | 70–90 | 50–75 |
| Loss of the limb below the knee | 50–70 | 50–70 | 60–80 | 50–70 |
| Loss of the foot | 40–60 | 40–60 | 60–80 | 50–60 |
| Loss of all the toes | 25–35 | 20–30 | 40–60 | 25–35 |
| Loss of the great toe | 15–20 | 10–20 | 20–40 | 15–20 |
| Great shortening of the lower limb (above 5 cm.) | 25–35 | 20–30 | 45–60 | 25–35 |
| Slight shortening of the lower limb (below 5 cm.) | up to 25 | up to 20 | up to 45 | up to 25 |
| Complete ankylosis of hip | 30–45 | 30–45 | 60–80 | 30–35 |
| Incomplete ankylosis of hip, according to degree | 10–30 | 10–30 | 40–60 | 10–30 |
| Complete ankylosis of knee | 20–30 | 20–30 | 40–60 | 20–30 |
| Incomplete ankylosis of knee, according to degree | 10–20 | 10–20 | 30–40 | 10–20 |
| Complete ankylosis of ankle | 10–25 | 10–25 | 40–60 | 10–25 |
| Incomplete ankylosis of ankle, according to degree | 0–10 | 0–10 | 30–40 | 0–10 |

## EVALUATIONS OF AMPUTATIONS OR

In the case of the upper limbs, the term active limb is applied to that to which handed people, the left arm in left-handed people). In some occupations both limbs

| Enumeration of lesions or mutilations. | Working Functions | | |
|---|---|---|---|
| | Pollici-digital ring. | Hold or pincers. | Grasp. |
| Ungual phalanx of thumb | Diminished | Diminished | Intact |
| Proximal phalanx of thumb | Impossible | Impossible | Intact |
| Thumb and its metacarpal | Impossible | Impossible | Intact |
| Ungual phalanx of index | Diminished | Diminished | Diminished |
| Loss of two phalanges of index | Diminished | Greatly reduced | Diminished |
| Loss of three phalanges of index | Impossible | Impossible | Greatly reduced |
| Ungual phalanx of middle finger | Intact | Intact | Slightly reduced |
| Loss of two phalanges of middle finger | Intact | Intact | Slightly reduced |
| Loss of three phalanges of middle finger | Intact | Intact | Slightly reduced |
| Ring finger | | *Same* | *evaluation as* |
| Ungual phalanx of little finger | Intact | Intact | Slightly reduced |
| Loss of two phalanges of little finger | Intact | Intact | Impaired |
| Loss of three phalanges of little finger | Intact | Intact | Much impaired |
| Loss of little finger and its metacarpal | Intact | Intact | Much impaired |

For the evaluation of the loss of several fingers of the same

NOTES.—The predominant function in the upper limb is that of the hand. The loss of the whole hand is equivalent to the loss of the whole arm; that is the solution, in short, given to the problem as an axiom in some tables of evaluation.

This principle constitutes an obvious exaggeration; according to the length of the limb which has been preserved there certainly remains a hope of making use of it: we have several times pointed it out. With this reservation it is only too true that the functions which persist in a limb deprived of the hand are very few, and of very little consequence.

In any case, if it is a question of the *active* limb, the exercise of the occupation becomes impossible. The prosthetic appliance never takes the place of the hand; it limits itself to concealment of the deformity, to render traction possible thanks to the *point d'appui* on the shoulder, and allows of fixation of the substance to be worked,

## DISARTICULATIONS OF THE HAND BY REMY

the injured person instinctively accords a predominant rôle (the right arm in right- are called on to give identical service, and both should be considered as active.

| OF THE HAND. | | | Reduction of value resulting from these lesions or mutilations. | | |
|---|---|---|---|---|---|
| | | | *For the hand*, considered by itself and *alone*. | For the *victim*, considered from the point of view of *his general* fitness for work. | |
| Rolling of fingers. | Direction. | Strength. | | If the *active* hand is affected. | If the *passive* hand is affected. |
| | | | | Per cent. | Per cent. |
| Diminished | Diminished | Diminished | 1/10 | 6 | 4·8 |
| Impossible | Greatly reduced | Greatly reduced | 1/3 | 20 | 16 |
| Impossible | Greatly reduced | Diminished | 1/2 | 30 | 24 |
| Preserved | Diminished | Preserved | 1/10 | 6 | 4·8 |
| Preserved | Diminished | Preserved | 1/8 | 7·5 | 6 |
| Diminished | Diminished | Diminished | 1/5 to 1/4 | 12 to 15 | 10 to 12 |
| Intact | Intact | Intact | 0 | 0 | 0 |
| Intact | Intact | Slightly reduced | 1/20 | 3 | 2·4 |
| Intact | Intact | Slightly reduced | 1/15 | 4 | 3·2 |
| *middle finger* | | | | | |
| Intact | Intact | Slightly reduced | 1/60 | 1 | 0·8 |
| Intact | Diminished | Diminished | 1/10 | 6 | 4·8 |
| Intact | Impaired | Diminished | 1/8 | 7·5 | 6 |
| Intact | Much impaired | Diminished | 1/6 | 10 | 8 |

hand the addition of the several estimates is sufficient.

but all works demanding strength and skill are suppressed. The sound hand by re-education should take the place of the lost hand.

If the accident involves the *passive* limb, the loss is much less, for the affected organ acts rather as a fixing agent, and hence can be replaced by a mechanical implement. Every finger of the hand has its relative value, for each of them possesses multiple functions and is really useful in work. But if we accept 4 per cent. for any finger of the hand (middle or ring) the figure no longer suffices for the index; we should raise it to 12 per cent., and it is even possible for one to have cause for its further increase, because this finger is more valuable in some occupations in which the victim would be engaged; in this case 15 per cent. would be equitable.

All other increase would seem to us exaggerated, and this figure itself is an exceptional one, applicable only to a skilled workman.

## EVALUATIONS OF ANKYLOSIS

This table is taken from Remy's work entitled "Evaluation des incapacités perma- published in 1906. Its figures differ from those in the second volume of his previously pub-

| Enumeration of lesions or mutilations. | Working Functions | | |
|---|---|---|---|
| | Pollici-digital ring or opposition. | Hold or pincers. | Grasp. |
| Terminal joint of thumb . . | Diminished | Diminished | Preserved |
| Metacarpo-phalangeal joint of thumb | Very diminished | Diminished | Preserved |
| Carpo-metacarpal joint of thumb . | Impossible | Very diminished | Preserved |
| Loss of two joints of the thumb . | Impossible | Very diminished | Preserved |
| Terminal joint of index . . . . | Slightly reduced | Preserved | Slightly reduced |
| Interphalangeal joint of index . | Impossible | Diminished | Diminished |
| Metacarpo-phalangeal joint of index | Impossible | Impossible | Greatly reduced |
| Loss of two joints of the index . | Impossible | Impossible | Preserved |
| Loss of three joints of the index . | Impossible | Impossible | Diminished |
| Middle and ring fingers . . . . | *Evaluation* | *for these two* | *fingers is one* |
| Terminal joint of little finger . . | Preserved | Preserved | Slightly diminished |
| Interphalangeal joint of little finger | Preserved | Preserved | Diminished |
| Metacarpo-phalangeal joint of little finger . . . . . | Preserved | Preserved | Much diminished |
| Loss of two joints of little finger . | Preserved | Preserved | Much diminished |
| Loss of three joints of little finger . | Preserved | Preserved | Much diminished |

For the evaluation of loss of several fingers of the

NOTES.—The gravity of ankylosis of the *thumb* depends on the possibility of forming a ring or of grasping: if consolidation has taken place in moderate flexion, the case is more favourable than if the abnormal position is one of complete extension.

For the other *fingers*, incurvation, even marked, is the least serious consequence, in so far that it allows prehension of tools: experience has distinctly demonstrated it. But the position in complete extension is deplorable, it should be assessed at a higher figure than the loss resulting from an amputation; the mutilated finger is indeed not only useless but also dangerous: because it catches in everything, in every attempt at work; if the skin is atrophied or the seat of other trophic or vaso-motor troubles the case is so much aggravated.

A great number of these ankyloses, moreover, can be improved by surgical treatment. The ankylosis of a finger is often more troublesome than amputation, and it is not rare for the victims to ask us to free them of it by the knife.

## OF THE HAND BY REMY

nentes basée sur la physiologie des fonctions ouvrières de diverses parties du corps," lished work entitled "Cours de chirurgie et de médecine légale des accidents du travail."

| OF THE HAND. | | | Reduction in value resulting from these lesions or mutilations. | | |
|---|---|---|---|---|---|
| | | | *For the hand*, considered by itself and *alone*. | For the *victim*, considered from the point of view of *his general* fitness for work. | |
| Rolling of fingers. | Direction. | Strength. | | If the *active* hand is affected. | If the *passive* hand is affected. |
| | | | | Per cent. | Per cent. |
| Slightly reduced | Preserved | Preserved | 1/20 | 2 | 1·6 |
| Slightly reduced | Diminished | Diminished | 1/15 | 7·6 | 6 |
| Very diminished | Diminished | Very diminished | 1/10 | 20 | 16 |
| Very diminished | Diminished | Very diminished | 1/4 | 15 | 12 |
| Preserved | Preserved | Preserved | 1/20 | 2 | 1·6 |
| Restricted | Diminished | Diminished | 1/10 | 3 | 2·5 |
| Much restricted | Diminished | Diminished | 1/8 | 7·5 | 6 |
| Much restricted | Diminished | Diminished | 1/5 | 12 | 10 |
| Much restricted | Greatly diminished | Diminished | 1/4 | 15 | 12 |
| *half of that of* | *the little finger* | | | | |
| Preserved | Preserved | Preserved | 1/50 | 0·6 | 0·5 |
| Preserved | Diminished | Diminished | 1/20 | 2 | 1·6 |
| Preserved | Diminished | Greatly diminished | 1/15 | 4 | 3·2 |
| Preserved | Diminished | Greatly diminished | 1/8 | 7·2 | 6 |
| Preserved | Greatly restricted | Much diminished | 1/6 | 10 | 8 |

hand, addition of the separate fingers is sufficient.

Blacksmiths, coachmen, victims of retraction of the two last fingers of the hand, Dupuytren's contraction, are not compelled to give up their work.

Whether stiffness arises out of an ankylosed joint, adherent tendons, or cicatrical induration of the soft parts, the result is the same.

*Section of Tendons* of the hand constitutes a less serious loss of function than their adhesion. When it is a question of the extensor tendon, the finger contracts and hides itself in the midst of the others without great inconvenience. If, on the contrary, it is the flexors which have been suppressed, the finger remains in extension and is more troublesome. If it is a tendon of the thumb which is damaged, the first phalanx no longer obeys; it is, as it were, suppressed: the pollici-digital ring, the digital hold can no longer functionate: it is then conceivable that there is an increase in the importance of the loss. The latter is then proportionate to what is extant of the functions of the tendons, and when many of these latter are cut, the affection can be equivalent to the total loss of the hand.

## EVALUATIONS OF DEFORMITIES OF THE HAND BY REMY

| Enumeration of lesions or mutilations. | Working Functions of the Hand. | | | | | | Reduction in value resulting from these lesions or mutilations. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Pollici-digital ring or opposition. | Hold or pincers. | Grasp. | Rolling of fingers. | Direction. | Strength. | *For the hand*, considered by itself and *alone*. | If the *active* hand is affected. | If the *passive* hand is affected. |
| | | | | | | | | Per cent. | Per cent. |
| Second metacarpal | Restricted (reduction of the two dimensions of the ring) | Possible | Restricted | Preserved | Possible | Diminished | 1/7 | 8·5 | 7 |
| Third metacarpal | Possible (the articular protuberance projects into the palm) | Possible | Restricted | Preserved | Restricted | Diminished | 1/7 | 8·5 | 7 |
| Phalanges | The deformity of the intermediate and metacarpal phalanges is equivalent sometimes to the loss of a finger. | | | | | | | | |

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